APR -4 1955

APRIL, 1955

METAL FINISHING

DEVOTED EXCLUSIVELY TO METALLIC SURFACE TREATMENTS

FOUNDED 1903

APR-5 1955

Do's and Don'ts in Plating Operations
Selection and Operation of Ion-Exchange Processes

Salt Spray Corrosion of Cadmium
Test Results on Plain and Chromated Deposits

Phosphate Coating Retention During Cold Extrusion of Artillery Shells
Radiometric Methods Show Retained Film

Tin Fluoborate Plating
Solution Addition Agents and Control

Science for Electroplaters
Elements

Complete Contents Page 37

WHERE PLATERS AND FINISHERS LOOK FOR INFORMATION
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FINISHING PUBLICATIONS, INC.

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WASHING MACHINE CLEANERS

Are Effecient

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for STEEL, CLEPO 126
a heavy duty alkaline cleaner.

for ALUMINUM, and all metals
CLEPO 85-AN, an inhibited alkaline cleaner.

for ALL METALS, CLEPO 8-S and
CLEPO 8-T, emulsion-type cleaners
not effected by acids, or water hardness.

CLEPO PRODUCTS have been carefully developed in our laboratories, thoroughly tested in production and are backed by over 20 years of experience in cleaner manufacture.

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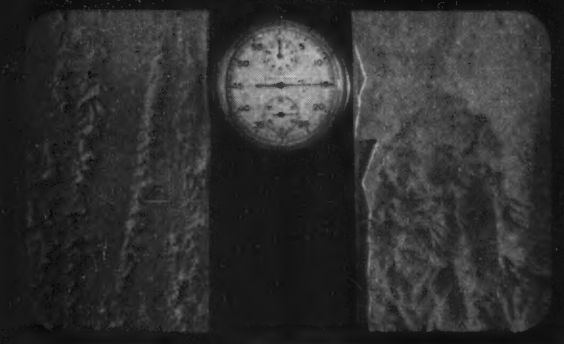
APR -4 1955

STRIPPING ENAMEL . . .

SAVING TIME

*Enthonics** AT WORK

IMMERSED . . . THE WATCH STARTS!



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25 seconds from immersion to completed stripping!

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And ask for your copy of the "Enthone Check List" of literature covering more than 60 products and processes developed for modern electroplating and metal finishing.

** The Scientific Solution of Metal Finishing Problems*

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METAL FINISHING PROCESSES

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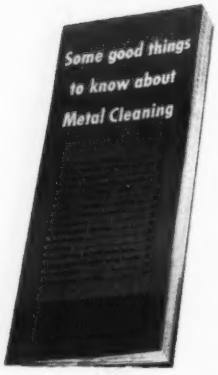
Oakite has 7 new ways to help you

Oakite chemists have developed efficient new materials for the seven important jobs listed below. One of these new materials may provide the perfect solution for your most difficult problem.



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Tell us which job gives you trouble (or circle the corresponding number in the coupon). We'll give you information about the new material that does the work, also send you our 44-page illustrated booklet "Some good things to know about Metal Cleaning."

1	**HEAVY-DUTY CLEANING IN TANKS:** New material combines the best qualities of alkaline and solvent cleaners.
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Metal Finishing is published monthly by the Finishing Publications, Inc., 381 Broadway, Westwood, New Jersey, U.S.A. Entered as second class matter at the Post Office in Westwood, N. J. Volume 53, No. 4, April, 1955. Four Dollars Per Year.

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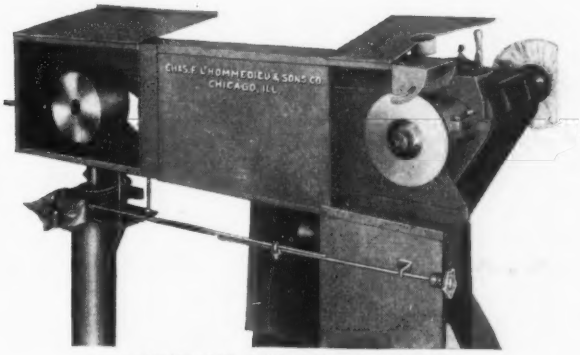
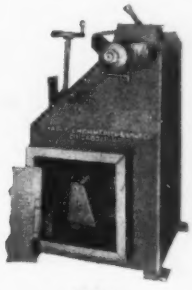
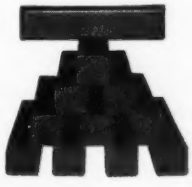


BACKSTAND IDLER WITH LATHE

OBLIQUE
TUMBLING BARREL



#23A
POLISHING LATHE



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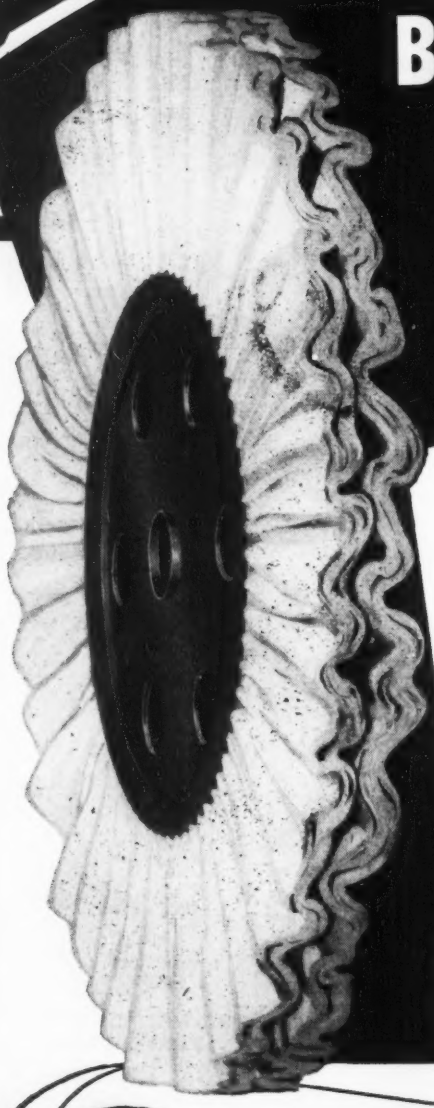

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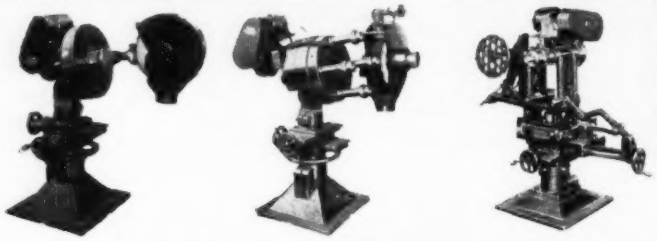
ACME *Automatics* PUT POLISHING *and* BUFFING OPERATIONS *on a low cost production basis . . .*

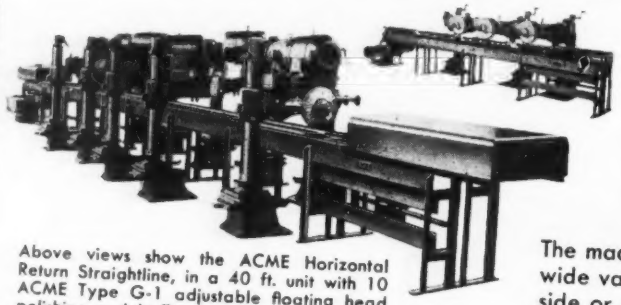
ACME *Semi-Automatics*



ACME Semi-Automatics are built to "deliver the goods." They can be fully relied upon to cut finishing costs, maintain production levels and stand up under long hours of operation!

The three ACME Semi-Automatics above are from left to right, the ACME A-2, a 2 spindle hand indexing machine for polishing and buffing cylindrical parts up to 12" diameter . . . the ACME L-4, a 4 spindle automatic indexing machine with a normal range of 250 to 400 indexes per hour . . . and the ACME D-10, an oscillating machine for finishing out of round parts. These machines are proved producers.

WRITE FOR CATALOG ILLUSTRATING WIDE RANGE OF TYPES



Above views show the ACME Horizontal Return Straightline, in a 40 ft. unit with 10 ACME Type G-1 adjustable floating head polishing and buffing lathes . . . and a 20 ft. unit with 3 ACME Type G-3 lathes.

ACME *Straight Lines*

ACME Straightlines provide effective solutions to many finishing problems. ACME progressive experience and engineering assure dependable performance at high production levels.

The machine illustrated is unusually versatile and adaptable to a wide variety of work. It may be loaded or unloaded from either side or either end. Polishing and buffing heads may be used on either or both sides and may vary in number to suit the required production and finish.

WRITE FOR OUR STRAIGHTLINE CATALOG ILLUSTRATING OTHER TYPES

ACME *Rotary Automatics . . .*

ACME 40" Rotary with 6 station indexing table and 4 ACME Type G-1 lathes with belt arm attachment. One second indexing time . . . up to 1800 indexes per hour. Acme Indexing Rotaries are available in table sizes from 18 in. to 10 ft. diameter.

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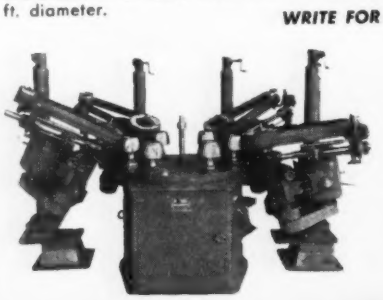

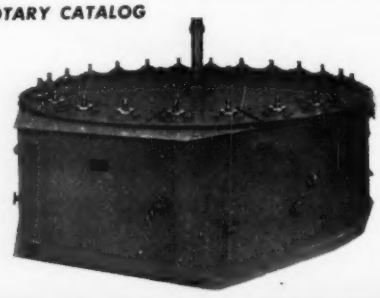

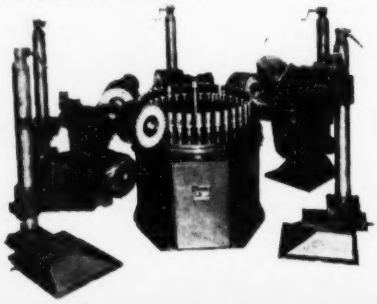

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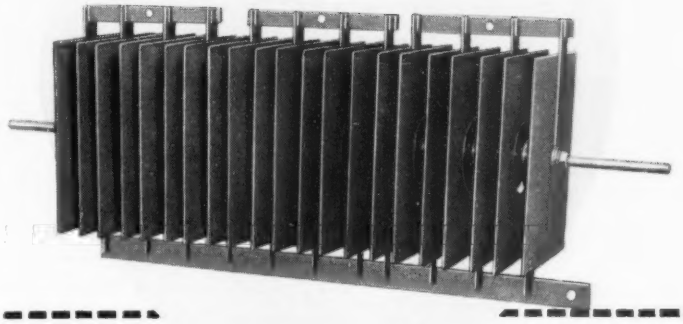

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The selenium stack is the heart of any selenium rectifier. For it is the quality of the stack and its accompanying circuitry that determines the effectiveness of a rectifier, just as the state of the heart and blood vessels of a human determine his strength and health.

IT'S A PROVEN FACT, RAPID RECTIFIER STACKS STAND UP LONGER IN HARD SERVICE. HERE'S WHY:

1) Rapid allows 6 square inches per ampere of plate surface in full wave bridge circuits. For years we have maintained this standard (somewhat higher than other makes), since we feel allowing this much area results in maximum life expectancy.
2) The plates in Rapid stacks use triple purified Selenium.
3) They are carefully tested and balanced for even current distribution.
4) They are coated with an exclusive material rendering them absolutely impervious to the corrosive conditions existing in plating rooms.
5) The plates are spaced an average of ½ inch, diminishing the possibility of dust, dirt and corrosive material becoming lodged between plates, thus allowing heat to dissipate readily.

Rapid designs its stacks to much higher standards than most other manufacturers.**

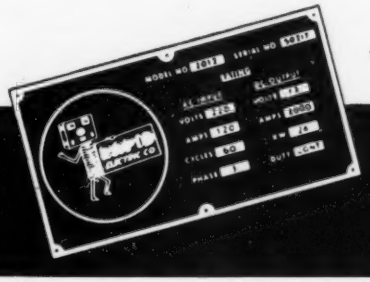
For example:

In tests performed at ambient temperatures of over 30°C, a recognized electrical manufacturers' group standard allows a temperature rise in the stack of 60°C; and, a rise of 40°C at the same ambient temperature for 1000 hours is permitted without derating.

Rapid standards permit a maximum stack temperature rise of only 22°C above the ambient. This low rise is made possible only because of the large area used per ampere, the plate spacing, high purity of Selenium used, the advanced circuitry and the engineering skill which designs the complete rectifier unit for the specific job.

So, when you buy a rectifier, check its heart. Make sure the one you buy offers the most advanced design for longest life . . . In other words, make sure you get a Rapid Rectifier.

*In forced air cooled, three phase, full wave bridge circuit units.
**All three phase rectifiers are designed with a full wave circuit.



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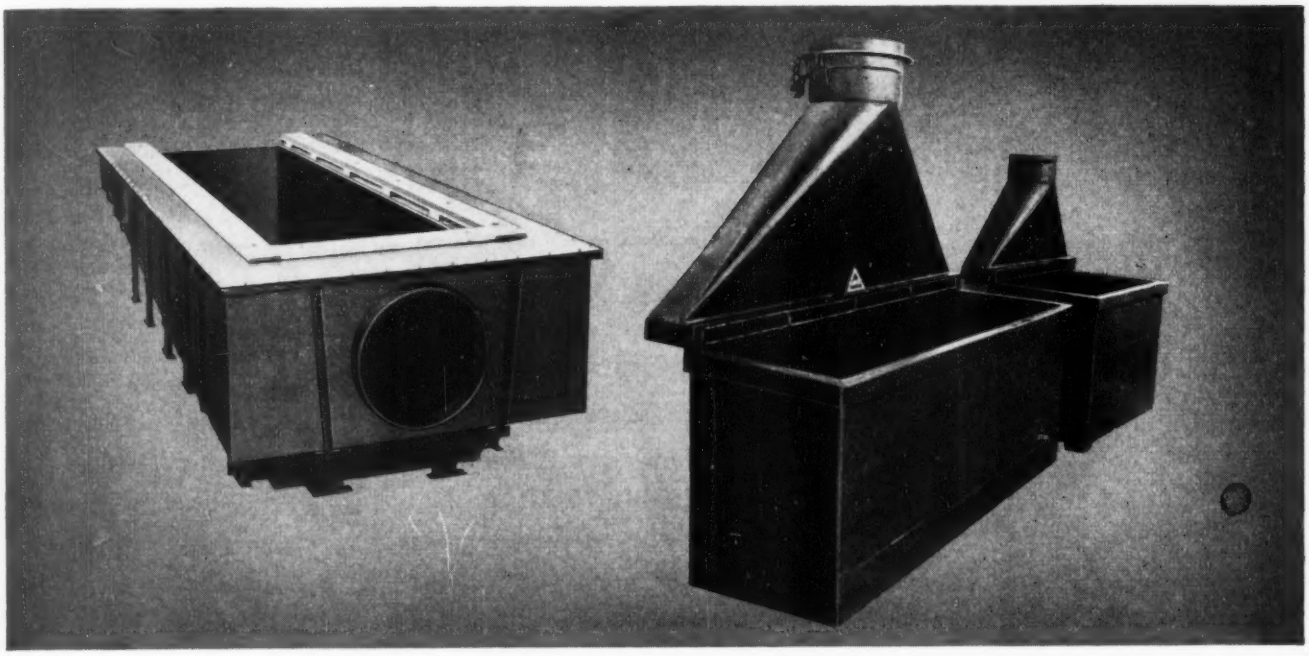

Metal Finishing Corrosion has been Controlled!

All Haveg equipment has extra long life, extreme resistance to corrosive chemicals, and can be used continuously in a high range of process temperatures with complete safety.

Because Haveg corrosion-resistant tanks prevent specking or flaking, the number of rejects is reduced, finished plating is uniform. Solutions do not build up on Haveg, reducing clean-up time.

Molded Haveg tanks are made in a single piece construction. Any size, style, baffle arrangement can be supplied to fit your process. They are made for long service life to improve production.

Remember, Haveg is not a coating or tank lining. It is a moldable rigid, plastic material made from acid-digested asbestos and specially selected synthetic resins. Throughout its entire mass, Haveg is resistant to most acids and salts, chlorine, practically all solutions used for finishing metals.

Haveg can help you make your finishing operations more profitable and less subject to the waste of corrosion. Call the sales engineer listed and write for 64-page Bulletin F-6 which shows tank sizes, shapes, chemical ratings . . . the complete Haveg story.

NEW HAVEG POLYESTER GLASS TANKS

Haveg polyester glass tanks for the metal-finishing industry are tough, can take hard knocks. They withstand the attack of acids normally used and are non-conductors of electricity. Where necessary, walls can be reinforced with corrugated construction or with steel ribs molded into the Haveg tank. Overflows for rinses also can be molded to fit your system. Write for more details.

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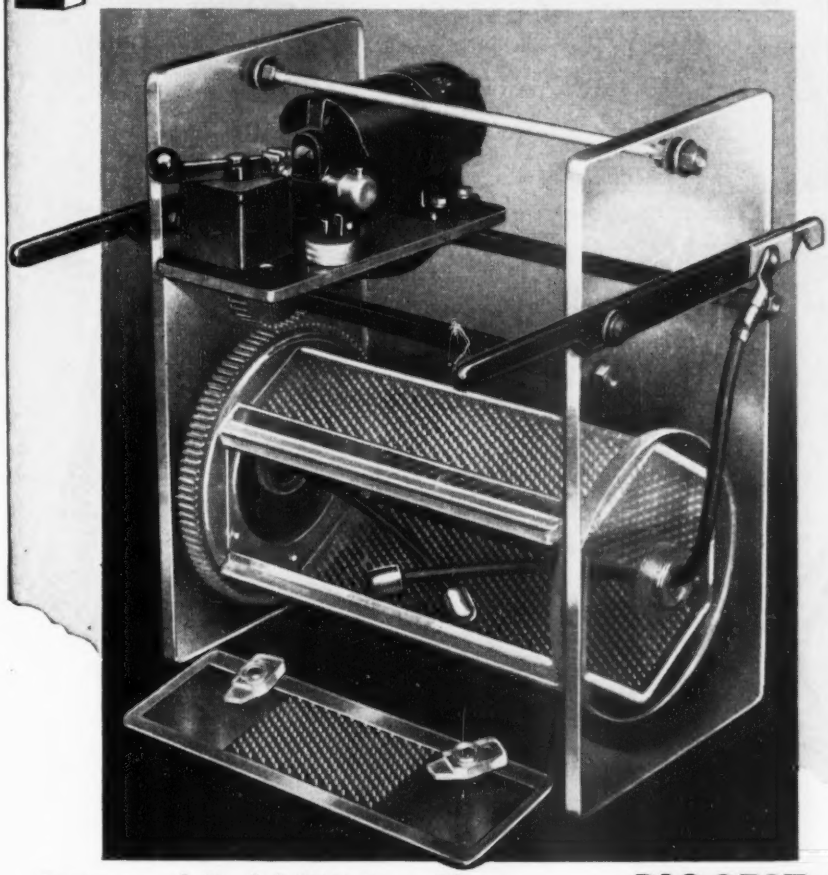

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Weight Empty, 28 lbs. Plating Capacity, ¼ peck.

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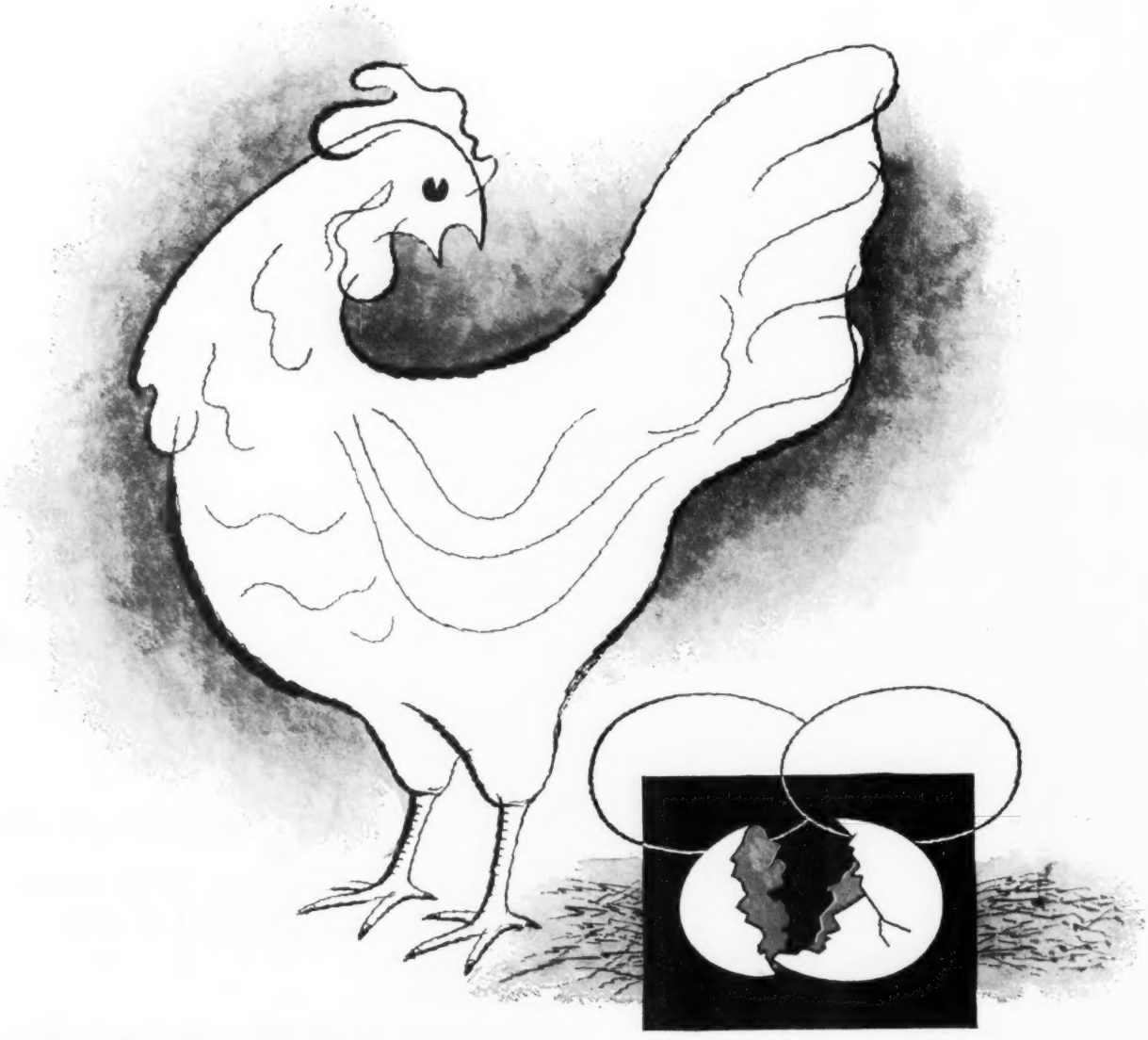

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T-122.....Some Economic Aspects of White Water Treatment in Pulp & Paper Mills
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T-124.....Removing Oil from Water by Flocculation and Filtration
T-129.....The Treatment of Sewage Plant Effluent for Water Reuse in Process and Boiler Feed

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Industry leaders choose *Chandeysson*

ELECTROLYTIC GENERATORS

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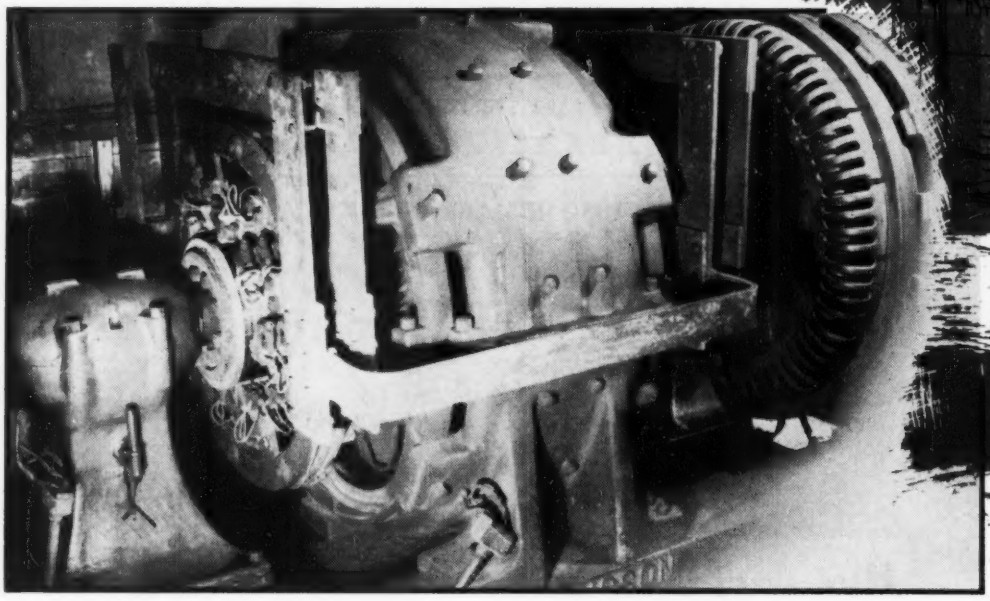
AT ALUMINUM FINISHING



CONVERT WITH *Chandeysson* **AND**

CHANDEYSSON ELECTRIC COMPANY

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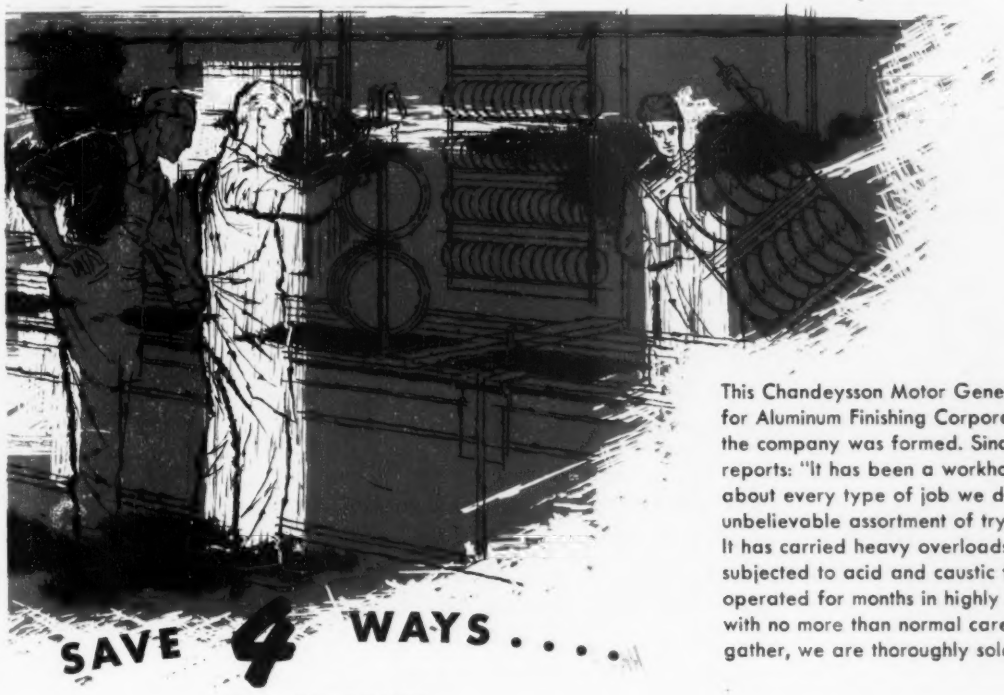
OF ALUMINUM . . .

CORPORATION, INDIANAPOLIS, INDIANA



This Chandeysson Motor Generator went to work for Aluminum Finishing Corporation in 1936 when the company was formed. Since then the company reports: "It has been a workhorse . . . powering about every type of job we do under an unbelievable assortment of trying conditions. It has carried heavy overloads, it has been subjected to acid and caustic fumes, it has operated for months in highly humid atmosphere with no more than normal care. As you may gather, we are thoroughly sold on Chandeysson."

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USE LESS POWER . . .
precision-built for efficiency and built-in voltage regulation.

GET MORE OUT OF THE POWER YOU PAY FOR . . .
built-in high power factor at no extra cost.

BE SURE OF POWER WHEN YOU NEED IT MOST . . .
overload capacity as great as 50% momentarily and 25% sustained, without distress or damage.

ENJOY LIFETIME POWER DIVIDENDS . . .
sustained, lifetime overall constant efficiency as high as 85% does not decrease with age or overload.

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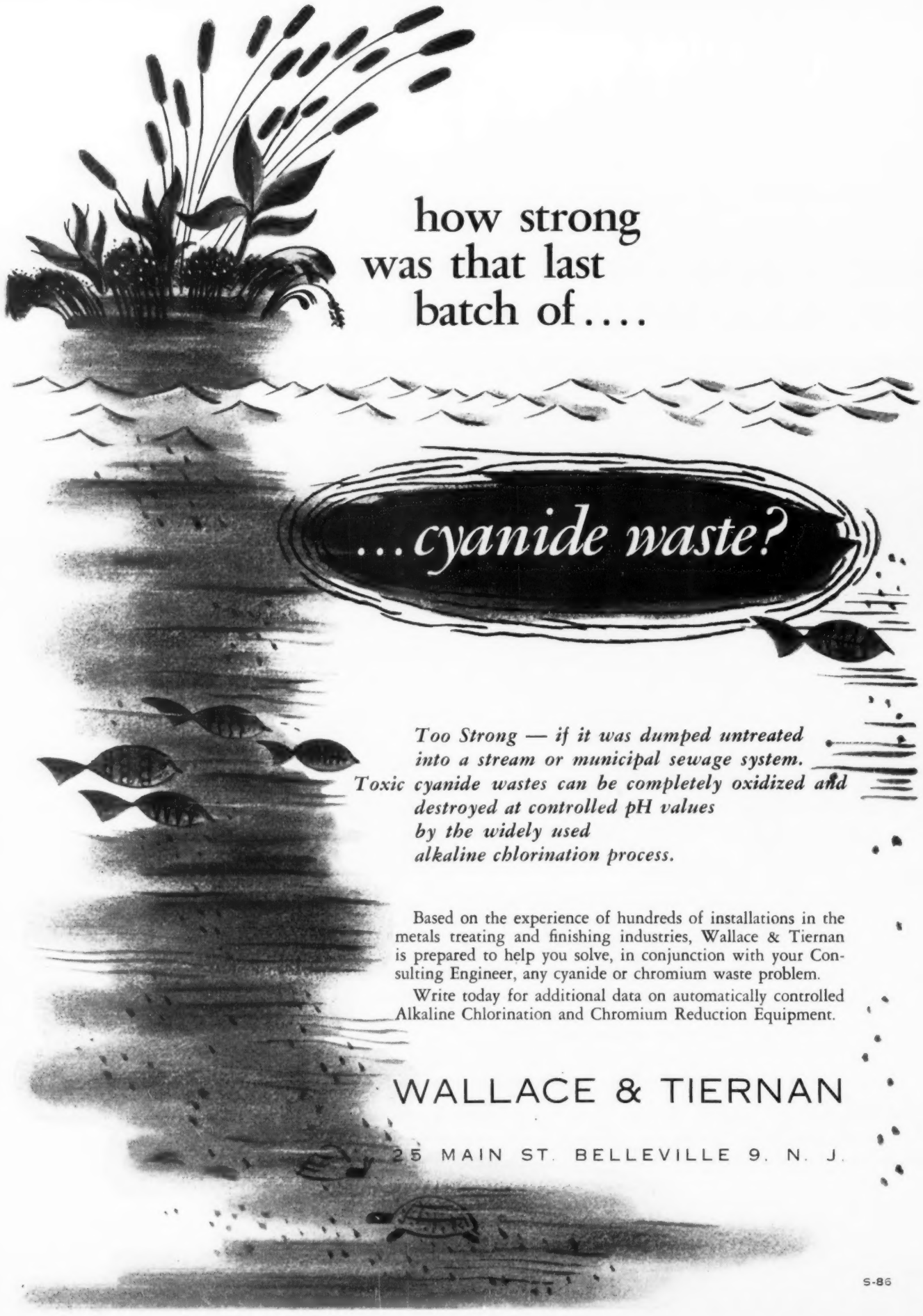
City.....*Zone*.....*State*.....

CHA-46


how strong
was that last
batch of....
...cyanide waste?
Too Strong — if it was dumped untreated
into a stream or municipal sewage system.
Toxic cyanide wastes can be completely oxidized and
destroyed at controlled pH values
by the widely used
alkaline chlorination process.
Based on the experience of hundreds of installations in the metals treating and finishing industries, Wallace & Tiernan is prepared to help you solve, in conjunction with your Consulting Engineer, any cyanide or chromium waste problem.
Write today for additional data on automatically controlled Alkaline Chlorination and Chromium Reduction Equipment.
WALLACE & TIERNAN
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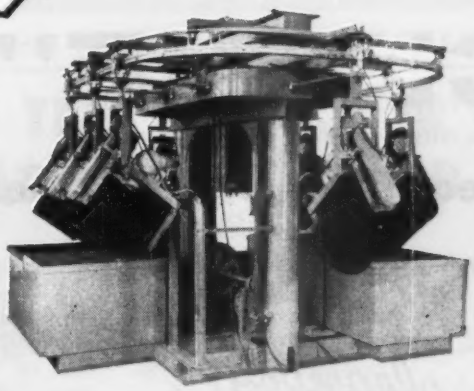
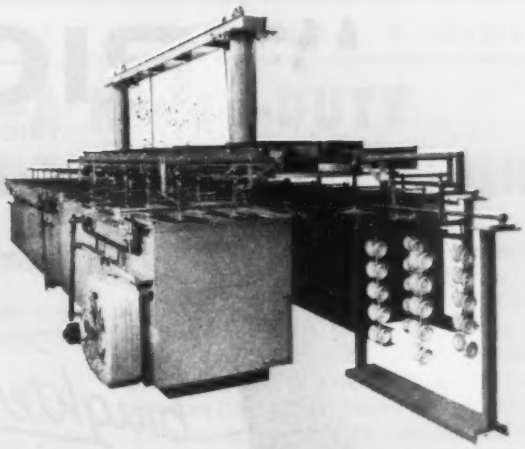
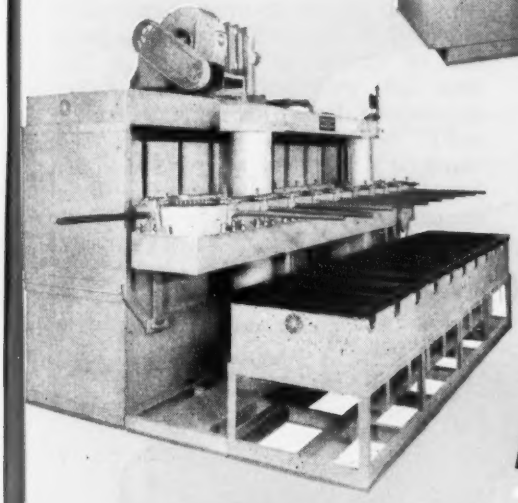
CROWN AUTOMATICS



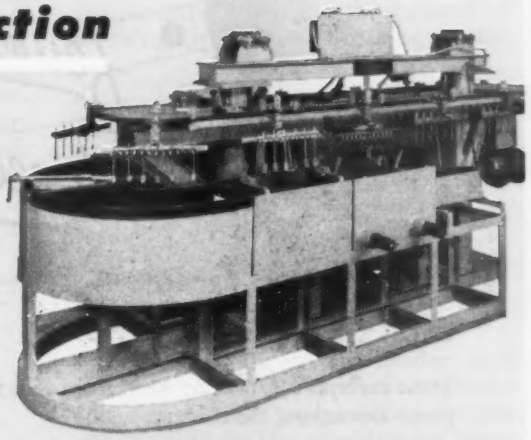


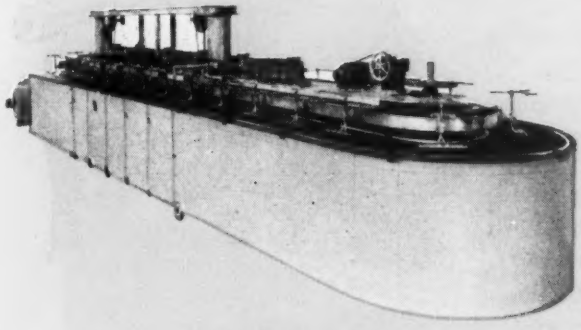


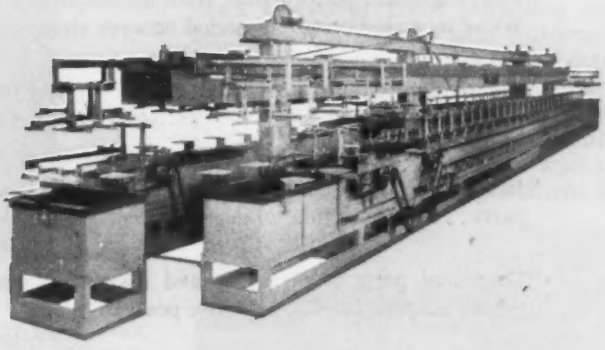
increase production

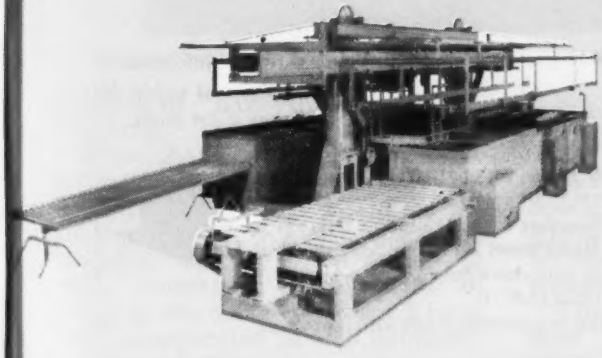
reduce costs

improve quality









Crown Automatics are ideal for plating your barrel or racked work. Crown manufactures the widest variety of fully automatic plating machines in the industry . . . *there is a model to fit your needs.* Write us details of your job and production requirements.

CROWN RHEOSTAT AND SUPPLY COMPANY

3465 N. KIMBALL AVENUE • CHICAGO 18, ILLINOIS

SAVINGS ADD UP

with all-purpose

"TRICLENE"® D

TRICHLORETHYLENE

Du Pont's Vapor Degreasing Solvent for Metal Cleaning

HERE'S PROOF:

These excerpts are from typical performance reports received from metalworking plants throughout the country.

"Fine, consistent performance. Both aluminum and brass parts are brighter. We've increased operating period between cleanouts by about 25 per cent."
—Parts Mfr., Mass.

"We're getting cleaner parts . . . extended operating time between cleanouts . . . reduced maintenance costs . . . effective recovery of stabilizers during normal distillation."
—Small Parts Mfr., West Coast

"In cleaning small aluminum, silver, copper alloy and zinc and stainless steel parts . . . cleanout time of degreaser and still has been cut by one-third."
—Appliance Mfr., Indiana

"Degreased parts are brighter and cleaner. Chemical control of solvent greatly simplified and . . . we have peace of mind."
—Airplane Producer, Los Angeles

Use the coupon for more information about "Triclene" D—the best vapor degreasing solvent for *any* class work.

New All-Purpose

"TRICLENE" D

Trichlorethylene

DU PONT

REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

SEND FOR THIS NEW DESCRIPTIVE FOLDER

E. I. du Pont de Nemours & Co. (Inc.)
Electrochemicals Department MF-4, Wilmington 98, Del.

☐ Please send me your descriptive folder on new, all-purpose "TRICLENE" D.

☐ Please have your representative call with the details.

Name _____ *Position* _____

Firm _____

Address _____

City _____ *State* _____

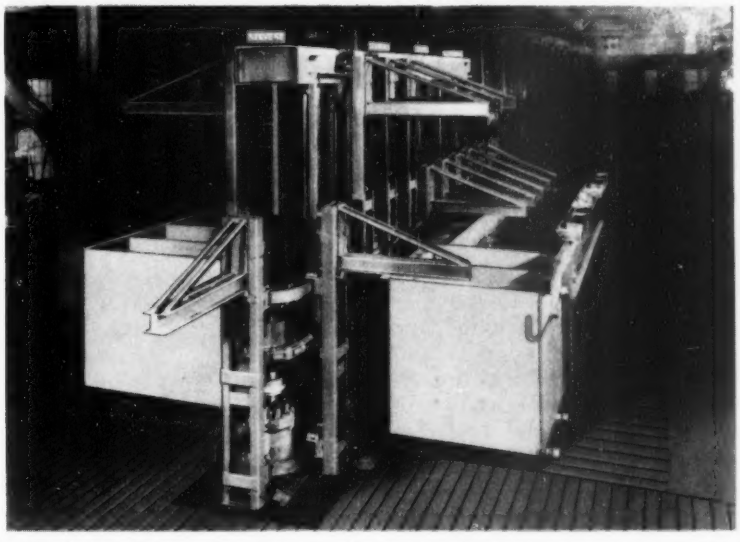
STEVENS Slants ON METAL FINISHING

"FROM THE CASTING OR STAMPING TO THE FINAL FINISH"

ANNOUNCING THE "STEVADOER"—A HEAVY-DUTY AUTOMATIC PLATING AND PROCESSING MACHINE

751st Machine by Stevens Designed for Single or Double Row and Automation

After three years of design, development and testing Frederic B. Stevens Inc. is proud to introduce to the metal finishing industry its new heavy-duty plating and processing machine—the "Stevadoer." This new machine has been built to complement the Stevens A and B Model Rack Type machines and the famous Stevens Model C and Super E Automatic Barrels. With the new "Stevadoer"—now more than ever, Frederic B. Stevens, Inc. lives up to its program of "Everything for Metal Finishing."



Load end view of the new Stevens "Stevadoer," automatic plating and processing machine.

When the "Stevadoer" first went to the drawing board the management directive called for unlimited lift, heavy load capacity, increased flexibility and versatile design to meet tomorrow's requirements of higher production—all of which have been incorporated in this outstanding new machine.

Take a look at the new Stevens "Stevadoer" and you will know that here is one of the most ruggedly built, compact metal finishing machines ever built. It will take almost unlimited rack sizes and will lift extreme weights. It has a high lift set is designed to take up a minimum amount of height and floor space as compared to competitive machines of similar capacity.

As has always been true of all Stevens machines, the "Stevadoer" has great mechanical flexibility. The Stevens-pioneered delayed set-down mechanism which provides independent timing in one or more tanks is, of course, a part of the design. Then, there is a timer control which permits a carrier arm to skip any particular tank or operation if desired.

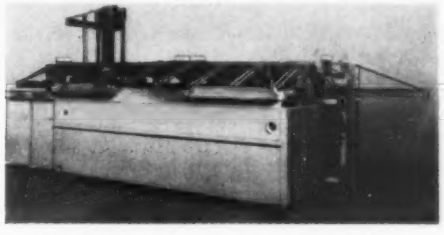
Smoothness of operation is another outstanding feature of the "Stevadoer." All lift and horizontal motion is accomplished by hydraulic power. Special controls permit independent adjustment of acceleration and transfer speeds to accommodate all extremes of weight and rack size.

The side arm design of the "Stevadoer" eliminates all moving mechanism over the solutions, and all internal mechanisms are installed below tank level. These features eliminate the possibility of contamination of processing solutions resulting from lubrication material, hydraulic oils and metallic wear. This design also reduces to a minimum the exposure of critical moving parts to the corrosive atmosphere of acid, alkalies and water vapor.

Safety requirements are built into the machine in that a 20-inch cat walk or wider can be easily provided between the processing tanks and the mechanism on two-row machines. This is, of course, extremely helpful in removal of anodes, inspection and maintenance without the hazard of working over hot processing tanks.

Access space for anode service and safety—a feature of the new Stevens "Stevadoer."

With the automatic loader and unloader the "Stevadoer" becomes the last word in automation. Racks are brought to the machine by overhead conveyor from polishing and buffing departments and automatically loaded without the use of manpower. After plating or other metal finishing processes have been completed the racks are automatically removed from the machine and rerouted to the proper department by the conveyor. Only one man is required to supervise the operation of the big capacity "Stevadoer."



Side view of the new Stevens "Stevadoer," plating and processing machine.

Frederic B. Stevens has more than 35 years experience in designing and building plating and processing equipment. If you are interested in high performance at low cost in metal finishing, check with Stevens, who can furnish you with the right machine for the job.

STEVENS *Slants* ON METAL FINISHING

MEET "LITTLE STEVE" AT A.E.S. SHOW

Plan to attend the American Electroplaters' Society Convention in Cleveland, June 20 to 23 and be sure to drop around to the Stevens exhibit and see "Little Steve"—another new Frederic B. Stevens, Inc. development.

Perhaps you have always wished for an automatic plating or processing machine for your job shop or plating department but didn't think you could afford one—well, look at "Little Steve."

"Little Steve" is a small automatic with a big capacity for its size. It will give you automatic production and automatic control—fewer rejects, dependability and lessens occupational disease hazards. With "Little Steve" you can eliminate a lot of the human element in your metal finishing operations and you can do it at a surprising low cost.

EX-CELL-O INSTALLS STILL TANK LINE

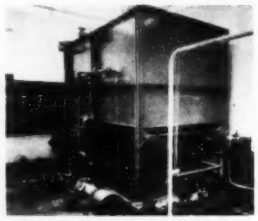
A still tank line for the plating of jet engine turbine discs was recently installed by Frederic B. Stevens, Inc. for the Ex-Cell-O Corporation at their Lima, Ohio plant. Stevens engineered the entire job and furnished rectifiers, Koroseal* lined and still tanks, horizontal barrels and a complete waste disposal system.

A view of the Stevens still tank line installed at the Ex-Cell-O Corporation, Lima, Ohio plant.

Since the turbine discs are spin-tested after plating in order to check the proper balance, the plating specifications must be rigidly adhered to, both for thickness of plate and spreading.

WASTE TREATMENT

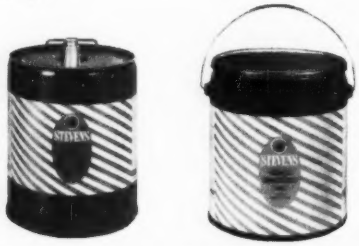
For disposal of cyanide and chromium plating solutions a Stevens waste disposal system was engineered and installed. The treatment called for total destruction of the solutions and all conditions were met with the Stevens equipment. Approval was given by the Ohio River Valley Water Sanitation Commission. After going through the Stevens engineered waste system the treated waste is released into the regular sewers.



This waste disposal unit treats chromium and cyanide plating solutions.

NEW CADMIUM AND ZINC PROCESSES

Frederic B. Stevens, Inc. recently announced two fine new plating processes to the electroplating industry.



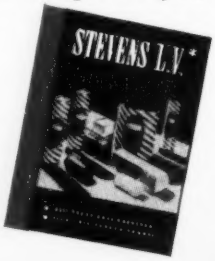
Stevco Bright Cadmium Process will furnish bright deposits to meet definite thickness of deposit and corrosion protection specifications. This process will impart a high lustre over a wide range of current densities. It is easy to control and offers increased operational economy resulting from complete solution integration.

Stevco Bright Zinc Process consists of water soluble Stevco Zinc Salts and economical Stevco Liquid Zinc Brightener. It produces a ductile bright zinc deposit of close grain structure, is easy to handle and also produces a bright plate. It has high conductivity which means fast plating and good distribution.

Finished work can be bright dipped or given a chromate treatment.

L.V.* REPORTS BIG AID TO FINISHERS

To assist in meeting industry problems in buffing and polishing, Frederic B. Stevens, Inc. maintains a laboratory which is always at your service. Send us a sample of your work and tell us the results you desire. We will recommend the materials, buffs and equipment in a complete formal *Laboratory Verified report.



*TRADE MARK B. F. GOODRICH

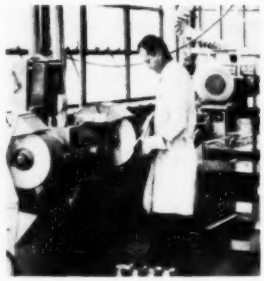
THE FINISHING TOUCH

VERSATILITY OF ALUMINUM FINISHES

by A. H. Kirkpatrick
Stevens Special Project Engineer

A look at the 1955 design engineer's drawing board leaves little doubt that aluminum is past adolescence.

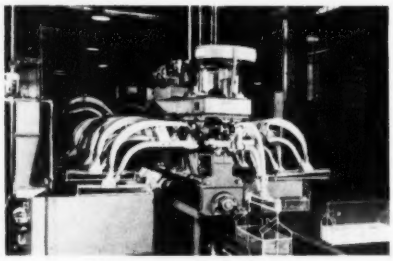
Aluminum responds to any number of finishing processes. Polishing and buffing will produce both satin and mirror bright finishes. Barrel Roto-Finishing will remove minor surface irregularities and improve the finish of small castings and forgings.



Stevens L. V. Experimental Aluminum Buffing Operations.

Many chemical and electro-chemical immersion finishing processes, including anodic etching, electroplating, anodizing, electropolishing and bright dipping add versatility to the finishing of aluminum. In anodizing, dyes can be added for brilliant colored finishes.

Aluminum's coming of age makes the task of producing these aluminum finishes a real job for the project engineer.



Stevens Automatic Equipment for bright dipping of aluminum.

Today, increased production, lowered costs and improved finishes, resulting from automatic, **job-qualified,** finishing installations are available to finishers of aluminum through Frederic B. Stevens, Inc. Stevens experience in the field of aluminum finishing ranges—

From the anodizing of refrigerator trays to the coloring of tumblers . . .

From the plating of automotive trim to the buffing of light reflectors . . .

From tumble finishing of aircraft assemblies to the alroking of rivets . . .

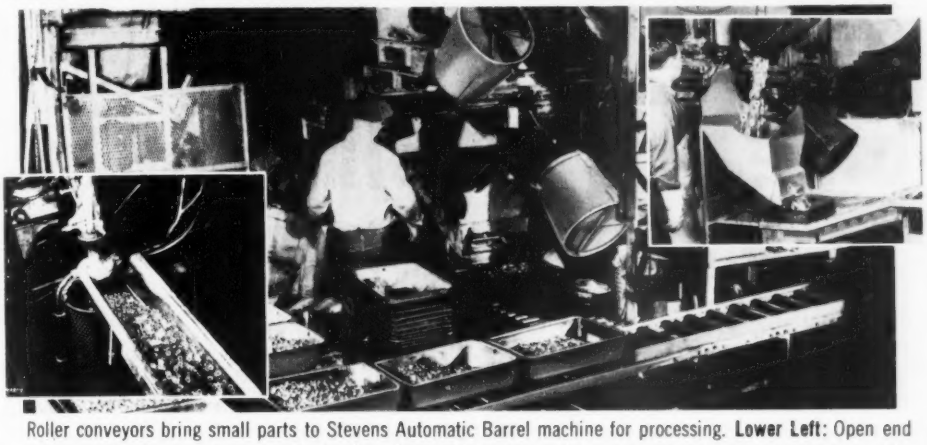
Stevens can engineer and build complete automatic or still tank installations for any chemical or electro-immersion aluminum finishing process —furnish the supplies and equip your company to do the best job at **lowest** cost. If it's made of aluminum we know how to finish it.

STEVENS *Slants* ON METAL FINISHING

ONLY STEVENS HAS FULLY AUTOMATIC BARREL—NO BARREL LIDS TO REMOVE FOR LOADING OR UNLOADING

Complete automation in small parts plating can be accomplished with a Stevens Automatic Barrel Plating Machine since the open end barrels permit mechanical loading and unloading of small parts without the need for manpower. In automatic barrel machines using horizontal cylinders it is necessary for workmen to remove the cylinder lids for loading and unloading. Stevens machines therefore, fit ideally into a fully automated factory production line.

The time tested Stevens Automatic Barrel Machines are noted for their economy, plating performance and simplicity. In fact, more Stevens Automatic Barrel Machines have been sold than all other makes combined. A few of the other many features are: Uniformity of plate, minimum of labor, less rejects, no mixing of parts and low maintenance costs.



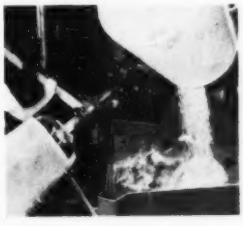
Roller conveyors bring small parts to Stevens Automatic Barrel machine for processing. **Lower Left:** Open end of barrel cylinder permits automatic loading. **Upper Right:** Up position of barrel, cylinder unloads by gravity.

USERS ACCLAIM STEVENS AUTOMATIC BARREL MACHINE

Users everywhere praise the Stevens Automatic Barrel. For example—

The Maytag Company in Newton, Iowa, says—"*Quality improved 70%. Our Stevens Machines give a substantial savings in manpower and require little maintenance.*"

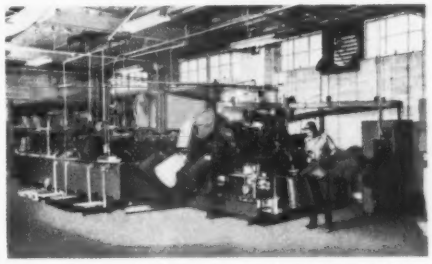
Daisy Manufacturing Company, Plymouth, Michigan—"*Bringing new profits and efficiency to our operation which requires a copper coating of shot pellets.*"



After copper coating at Daisy Mfg. Co. shot is dumped by the revolving barrel.

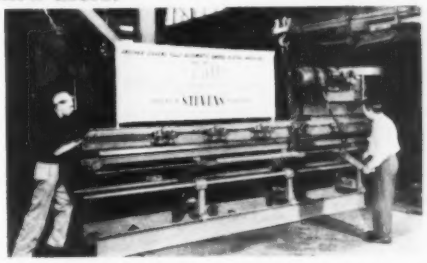
Thousands of small parts are zinc plated at the Unistrut Corporation plant at Wayne, Michigan. They report—"*Less handling, quicker shipments, smaller inventories plus a 50% plating cost reduction.*"

Homer A. Doerr & Son, St. Louis, Missouri, a thirty-year-old job plating firm, says—"*Gives us more uniform results, to closer tolerances, at higher production by far than with equipment formerly used.*"



A diversified group of parts is plated daily by this Stevens Automatic Barrel Machine.

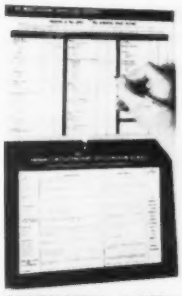
The report of the Schlage Lock Company of San Francisco, California, is—"*We get a more durable finish . . . better results . . . with our Stevens Automatic Barrel plating installation.*" These are but a few comments from hundreds of satisfied users.



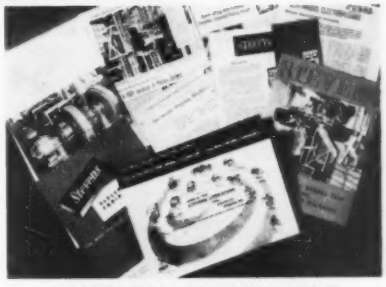
Stevens 750th automatic being readied for shipment to Spectronome Plating Co., Inc., New York City.

WRITE FOR FREE UTILITY FOLDERS

When you write for Stevens literature we mail the samples in a utility folder which can be used for three important purposes—a stock record to help you check your inventory—an emergency First Aid chart for plating room accidents—or a folder to file your Stevens literature. Write for your folders today.



Used for an inventory check. (top) a First-Aid chart. (middle) or a file folder for your Stevens literature.



MOVIE AVAILABLE FOR SHOWINGS

"Industrial Album," a twenty-six minute, 16-mm. sound film featuring the famed Stevens Automatic Barrel Machine is available for showings in your plant. Write us today and we will gladly arrange for a booking.

BRANCHES: BUFFALO • CLEVELAND • INDIANAPOLIS • NEW HAVEN

REPRESENTATIVES IN ALL PRINCIPAL CITIES

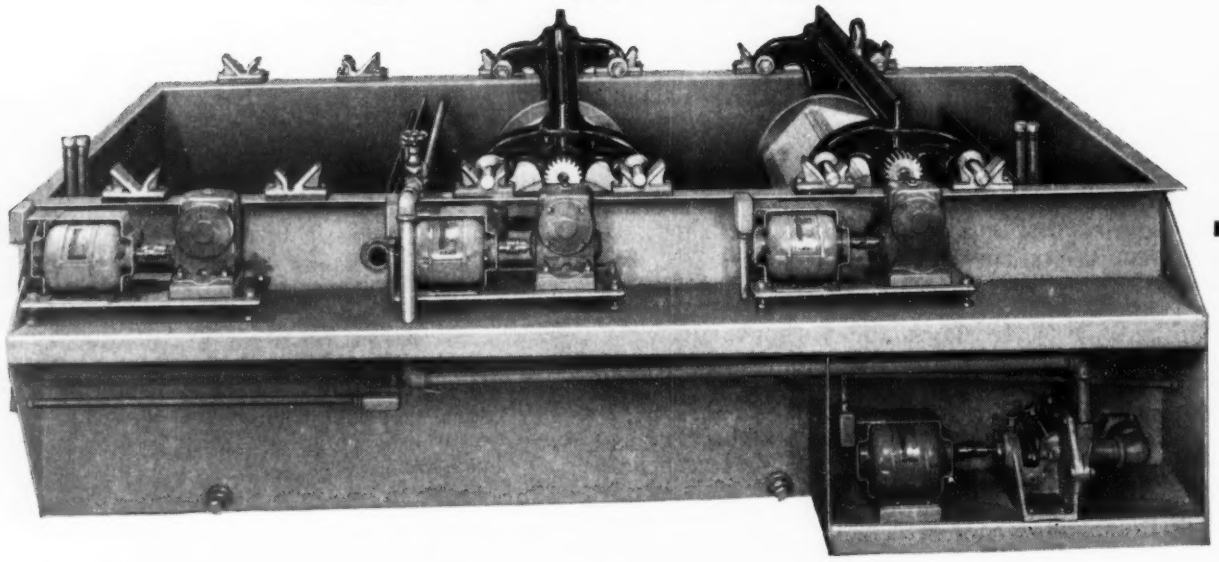
FOUNDRY FACINGS | GRINDING OPERATIONS | BLAST FINISHING | BARREL TUMBLING | METAL CLEANING | POLISHING & BUFFING | AUTOMATIC FINISHING | AUTOMATIC PLATING | METAL RECLAMATION

Metal Finishing equipment and supplies from castings or stampings to finished product

FREDERICK B. STEVENS INCORPORATED

YOUR METAL FINISHING SUPERMARKET

STUTZ



Alkali Cleaning and Rinsing Units

for heavy duty - high speed Production

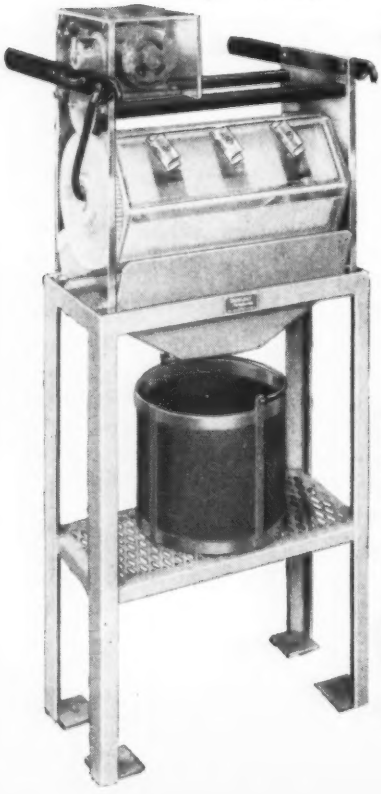
Stutz design in single or multiple units with or without rinsing compartment. Solution circulating pump for rapid elimination of surface grease into trap from which complete removal made by draining of trap compartment daily.

Rotation of work in cylinders together with solution agitation of pump provides complete cleaning in a single operation.

Cylinder drive and pump motors are 1/3 h.p. 440-220-3-60 with heater type motor control switches. Plate or pipe coils installed.

With this type of equipment, vapor degreasing is not required.

Can also be furnished for electrolytic cleaning and P. R. current will do excellent removal of heavy furnace scale, rust, etc.



STUTZ *Portable Plating Barrels*

Made in 2 standard sizes.	
Standard openings - 3/32"	
6" x 12"	$176.50
8" x 18"	$275.00
Stand	$ 37.50
Basket	$ 8.65

- **The Stutz Portable Barrel is made in 2 standard sizes with cylinders having inside dimensions of 6" x 12" and 8" x 18".**
- **Baskets in perforated metals or wire mesh.**
- **Load/Unload Stand for convenient and fast handling of work load.**

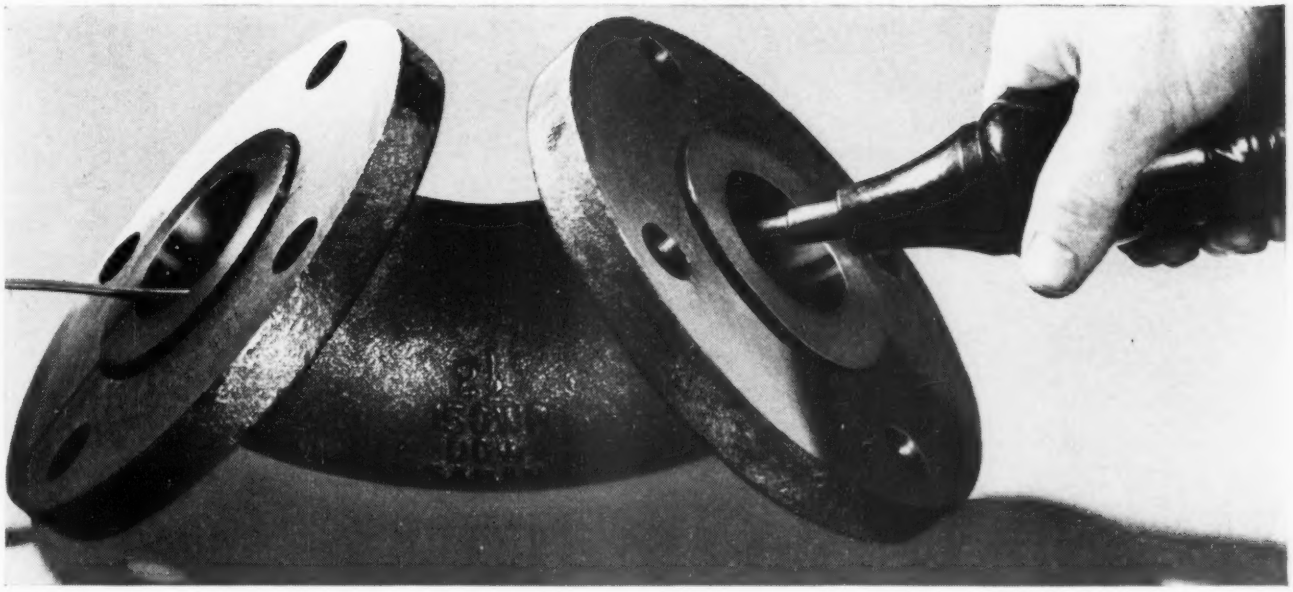
Write for prices and New 1955 catalog

GEO. A. STUTZ MANUFACTURING COMPANY

4430 CARROLL AVENUE **CHICAGO 24, ILLINOIS**

"Complete metal finishing equipment and supplies"

DOW



You can see why

SARAN LINED PIPE

KEEPS SHUTDOWNS TO A MINIMUM

It's made of corrosion-resistant saran pipe swaged into strong, rigid, nonbursting steel. And every piece is spark tested before you buy!

Unscheduled shutdowns are a thing of the past when you use saran lined pipe, fittings and valves to convey corrosive liquids. This modern, trouble-free piping is corrosion resistant . . . forms tight, snug, leakproof joints . . . won't burst under pressures up to 150 psi. And every single piece of saran lined pipe is carefully spark tested by hand to be sure that there are no pinpoint holidays or cracks in its lining. Cast steel lined fittings are available for higher pressures.

Installation costs are surprisingly low with saran lined pipes, fittings and valves, too. They can be cut and threaded in the field with standard pipe-fitter's tools. Their rigidity means few supporting members are needed.

If you want to convey acids, alkalies, or other corrosive liquids at low over-all cost, be sure to investigate saran lined pipe. Contact the Saran Lined Pipe Company, 2415 Burdette Avenue, Ferndale 20, Michigan, Department SP528C.

RELATED SARAN PRODUCTS

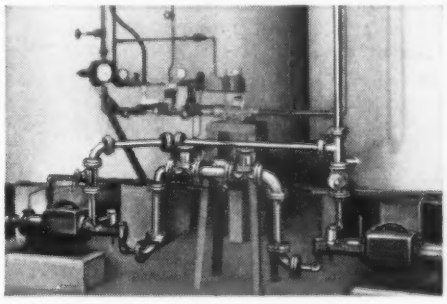
Tank lining • Saran rubber molding stock • Saran tubing and fittings • Saran pipe and fittings.

SOME OF THE MANY INSTALLATIONS USING

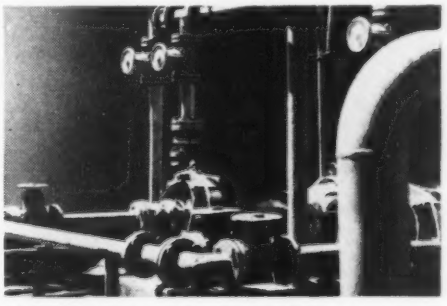
SARAN LINED

STEEL PIPE

Saran Lined Pipe is Manufactured by The Dow Chemical Company Midland, Michigan

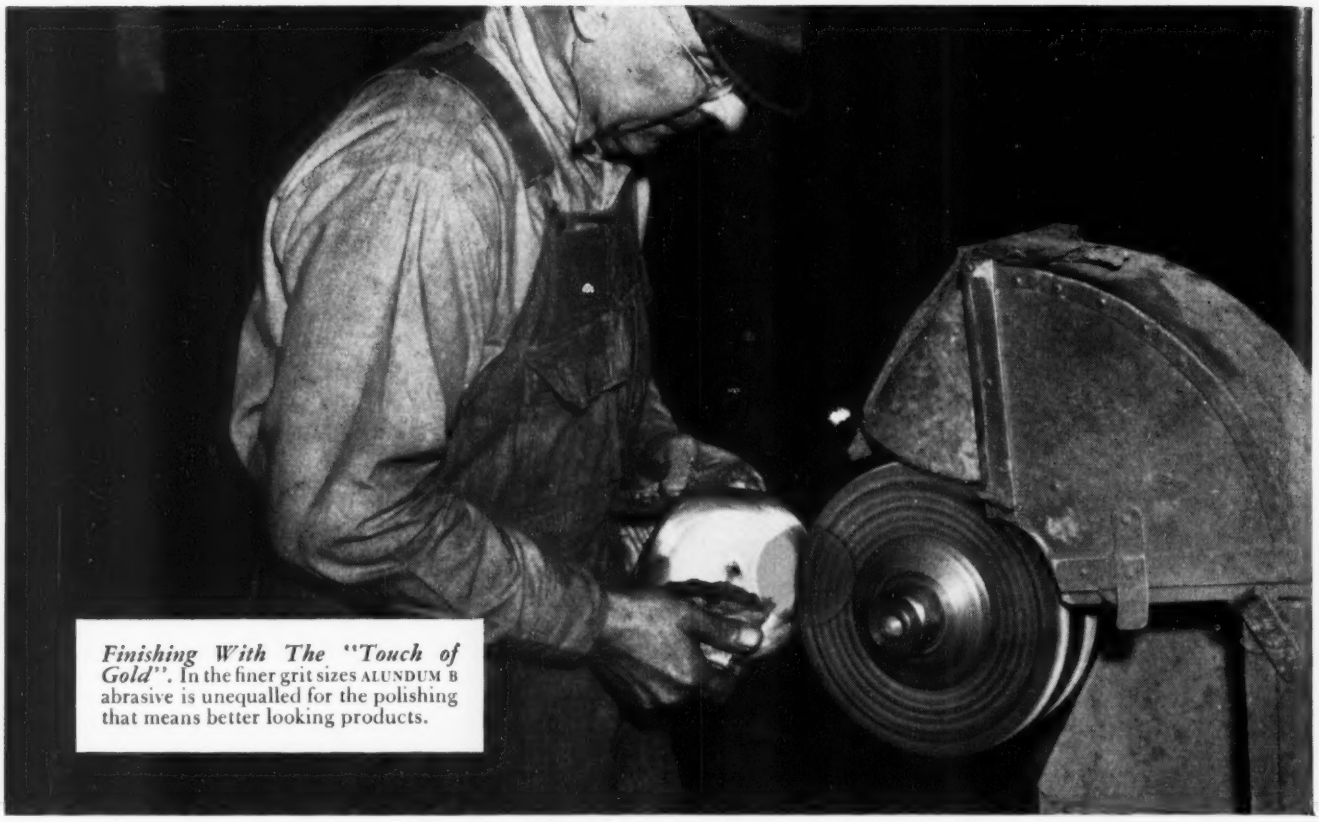


A large Southeastern paper mill uses saran lined pipe to handle corrosive alum solution. It has proved to be an exceptionally satisfactory answer to eliminating unscheduled shutdowns.



This installation of a large Midwest company has conveyed highly corrosive hydrochloric acid for over seven years. The joints have remained as tight and leakproof as new.

you can depend on DOW PLASTICS DOW



Finishing With The "Touch of Gold". In the finer grit sizes ALUNDUM B abrasive is unequalled for the polishing that means better looking products.

Across the range of polishing jobs . . .

Norton ALUNDUM* B Abrasive

adds the "TOUCH of GOLD" that steps up production and profits

Roughing With The "Touch of Gold" ALUNDUM B abrasive in the coarser grit sizes, removes stock faster, saves time and money.

In Norton ALUNDUM B abrasive you get a truly all-purpose polishing grain, expertly engineered to cut costs and improve product quality "across the board" in your polishing operations. Here are some typical advantages that mean top performance in every set-up:

- *Uniform grain shape,* the result of careful processing that eliminates flats and slivers, leaving only solid, blocky grains that stand up better and polish faster.
- *Uniform grain sizings,* with no oversize grains that mar the finish, no undersize grains that skip their share of work.
- *High capillarity,* assuring the easy absorption of adhesive that means longer lasting, better performing set-up wheels.
- *Usable with cement or glue,* it is equally firm-clinging and efficient with either.
- *Made in all grit sizes* from 20 through 240, to cover the widest range of polishing jobs, from roughing to fine finishing.

See your Norton Distributor

for prompt deliveries of Norton ALUNDUM polishing abrasive. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your phone directory, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

G 251

Making better products . . . to make your products better

NORTON

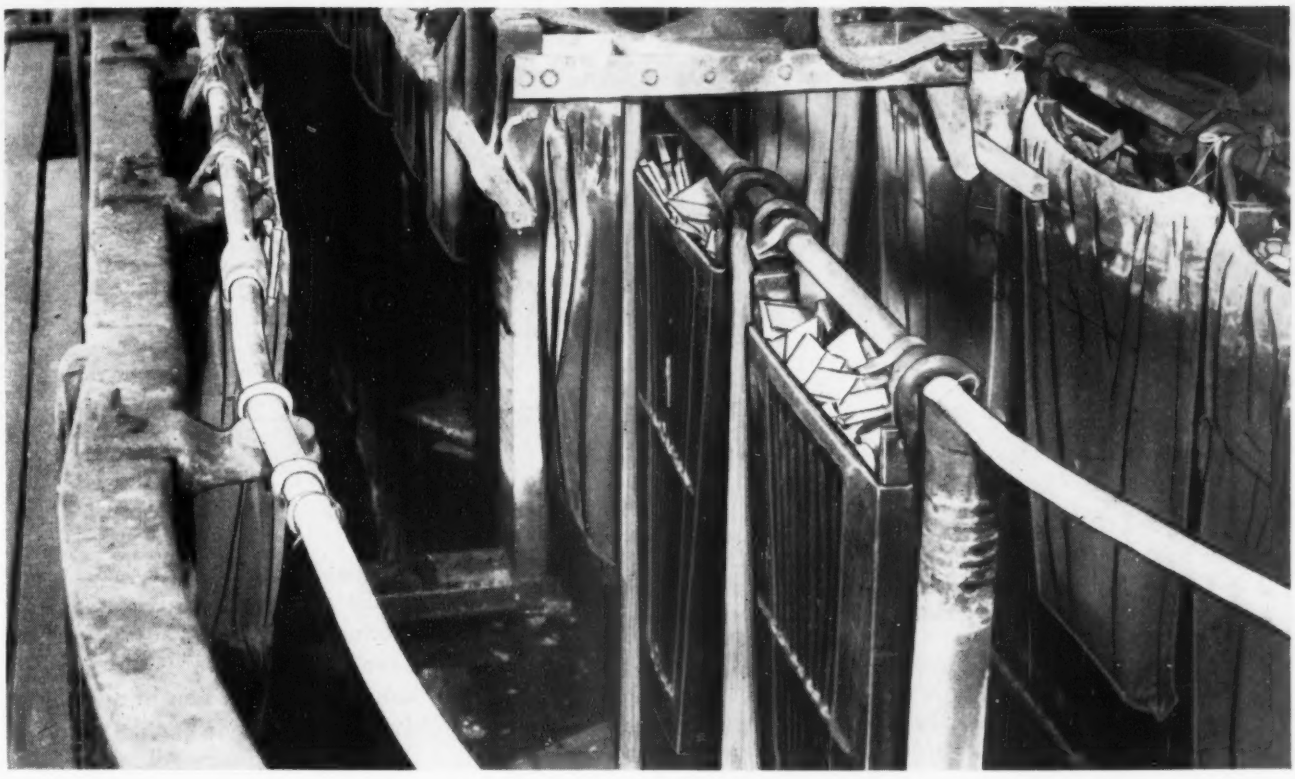
and its BEHR-MANNING division

NORTON: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

LOOK INTO THESE ANODE SAVINGS!

Loss from discarded odds and ends of anodes may seem trivial — but let's face it — the loss annually adds up to important money. For instance: the case of the 7,000 gallon full-automatic plating machine shown below! Here, 60 FORCITE ANODE BASKETS GIVE AN ANNUAL SAVINGS OF $7,200.00!



According to this plater's production records, the machine uses 6,000 lbs. of anodes per month. The 60 baskets make possible the use of less costly anode material which results in an annual saving of $7,200.00 in material. This saving is DOUBLE THE ORIGINAL COST of the baskets and equals a return of 200% on the investment!

Of interest to smaller plating installations is the fact that Forcite Anode Baskets produce proportional savings wherever used. In addition to important anode savings, they give greater anode area, smoother deposits, pass more current, permit larger loads. Every bath, with the exception of Chromium, needs this modern money-saving plating aid! Available in 18, 24, 30 and 36 in. lengths; other lengths on special order.

FORCITE CORPORATION, 31450 Shaker Blvd., Chagrin Falls, Ohio

JUST PIN THIS COUPON TO YOUR LETTERHEAD!

There's no obligation to find out how a small investment in Forcite Anode Baskets pays dividends — year after year!

FORCITE CORPORATION
31450 Shaker Blvd.
Chagrin Falls, Ohio

Yes, send details on
FORCITE ANODE BASKETS!

Name ..... Title .....

Company .....

Street Address .....

City ..... Zone ..... State .....

10 REASONS WHY THE COUNTRY'S FINEST COATERS USE

MICCROSOL

VINYL PLASTISOL

FOR INDUSTRIAL COATING!

1 They know that MICCROSOL is the highest quality material they can use.
2 MICCROSOL has become the accepted standard for coating plating racks, baskets, hangers, hooks, fixtures, ducts, tanks, tools, and many other parts.
3 The strength, toughness, scuff- and abrasion-resistance of MICCROSOL give your coatings longer life.
4 The permanent flexibility and positive, continuous adhesion of MICCROSOL enable them to meet the strictest specifications and technical requirements, for protective coatings.
5 They can depend on MICCROSOL to keep their reputations, and the quality of their work, at the highest level in the industry.
6 They have helped us develop MICCROSOL to its present point of perfection.
7 MICCROSOL is easier to apply. Gives you better coatings for less money.
8 MICCROSOL responds to their skill and experience. Helps them give you the rugged coatings you need to protect work and your equipment.
9 MICCROSOL coatings last longer.
10 They can depend on MICCROSOL!

You can't blame us for being proud of the quality of the coating work produced by our customers. We have worked with them, and for them, to the very best of our ability, during the phenomenal growth of the coating industry. We know them well, and appreciate their loyalty and support. And we hope to have the privilege of serving them all for many years to come.

There's a MICCROSOL Coater located in your vicinity. He's undoubtedly the leader in his field. If you want superior coating jobs, we'll be glad to help you get in touch with him!

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MICHIGAN CHROME *and Chemical Company*

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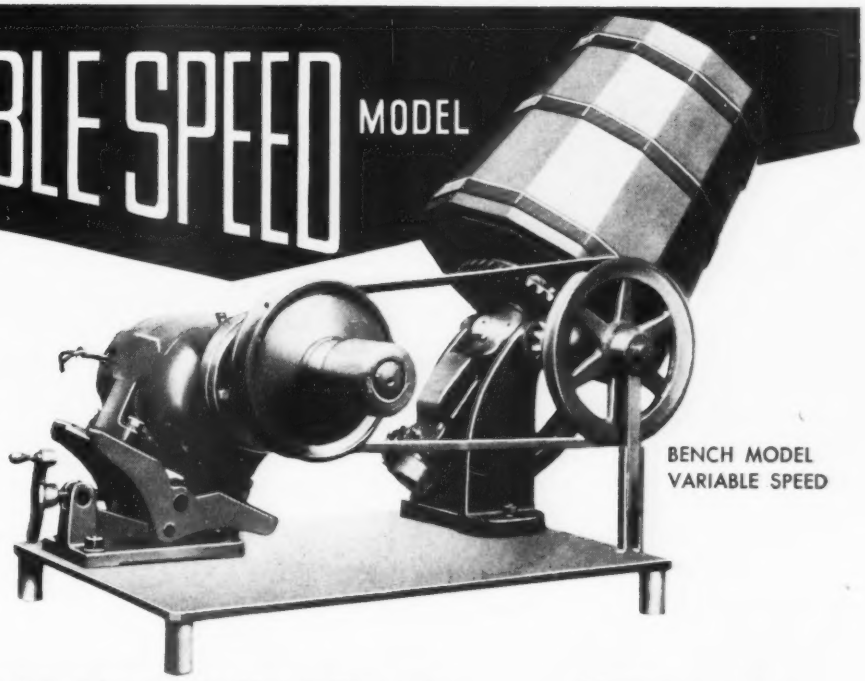
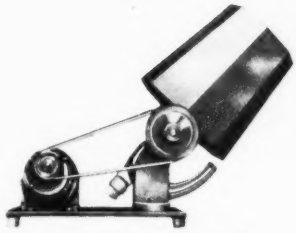
INTRODUCING—our NEW

VARIABLE SPEED MODEL



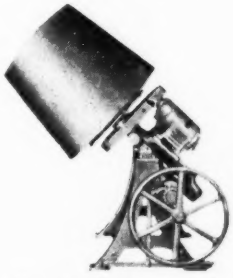
BENCH MODEL
VARIABLE SPEED



Bench-Type Single Speed

No. 5—Single Speed

No. 5A—Single Speed



No. 6—Single Speed

Note Carefully These IMPORTANT POINTS

Barrels can be filled with parts or abrasive—*while running.*

Work can be watched — samples removed for inspection — *while running.*

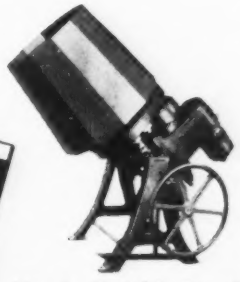
Angle can be changed for best abrasive or polishing action — *while running.*

Barrels can be emptied by tilting to pouring position — *while running.*

Barrels are made in various sizes, shapes, and materials. They are easily replaced.

No. 5—Variable Speed

No. 5A—Variable Speed



No. 6—Variable Speed

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THE HARSHAW CHEMICAL CO.
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HONITE Barrel Finishing Produces

Superfine Sanitary Finish!

Cherry-Burrell Corporation, Milwaukee Division, made large savings when they switched to the HONITE Barrel Finishing Method, *and* actually improved the sanitary finish necessary on their line of food processing equipment.

The milk filler tank shown below was formerly finished in two hand operations—grinding to remove weld splatter and generally improve the surface, and polishing to bring the surface down to 15 R.M.S. Recently, Methods Engineer, Ralph Wenger, supervised a change to the HONITE Barrel Finishing Method.

Results? The recommended HONITE procedure eliminated the polishing operation completely, and 60% of the rough grinding hand operation. Finishing time was cut 1½ hours . . . and finishes were improved to a superfine finish.

Your HONITE Methods Engineer or nearby HONITE distributor will show you how *you* can increase production and cut costs, too. Call him today!

Remember, too, the HONITE Division of the 3M Company supplies a *complete line* of abrasive chips, compounds and equipment for every barrel finishing need.

CHERRY-BURRELL METHODS ENGINEER, Ralph Wenger, holds a 40 lb. stainless steel milk filler tank. HONITE Barrel Finishing Method produced its superfine finish.

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DEPT. MF-45, ST. PAUL 6, MINN.

☐ *Send me FREE copy of "Facts and Figures Report on HONITE Barrel Finishing"*

☐ *I'd like to talk with a HONITE Field Engineer*

Name..... *Title*.....

Company.....

Address.....

City..... *Zone*... *State*.....

Type of product to be finished.....

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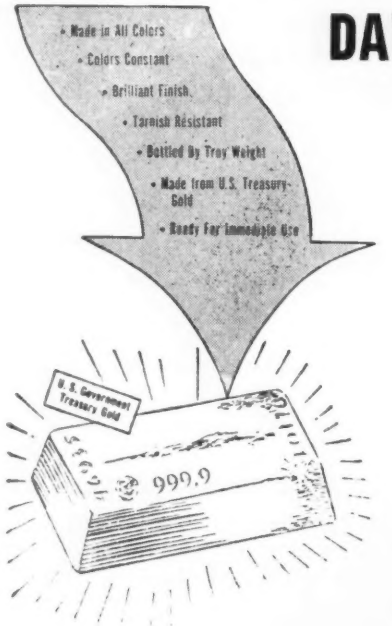
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TANK RHEOSTATS: We are pleased to announce our variable type tank rheostats which are specially designed for precious metal plating.

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DAVIS-K SERVICE: Our service today with its newly expanded facilities is fast and efficient. We are fully equipped to reclaim your old gold and rhodium solutions. Phone or write your precious metal problems. We welcome them!

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Liquimatic®

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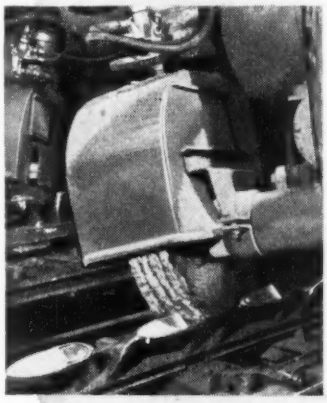

How much of the compound in your buffing room is wasted... in the nubbin pile, or in "over-heading" buffs? There's a way to "meter" the compound you use—the Liquimatic way. An electrically timed system in the Liquimatic Process feeds the exact amount of liquid compound for the exact cut you need. While compound is being saved, buffs are being saved too ... continual lubrication extends buff life up to 400%.

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Check the other features of Liquimatic ... then write today for your free copy of Liquimatic's big, new folder that tells the whole cost-saving story of Liquimatic in *your* buffing room.

Liquimatic ...

gives more buff mileage

These additional Liquimatic features mean real savings in terms of time, money, safety—

- longer buff life
- completely automatic
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G-E Germanium Rectifier Cuts Cost of DC Power For Anodizing By 12½%

The General Electric germanium rectifier illustrated is one of seven units now powering anodizing operations at Appliance Park, Louisville, Ky. Together, these seven units furnish 40,000 amperes at 24 volts.

ECONOMY—The economy of this installation is as newsworthy as its size. The seven rectifier units cost only ¾ as much as rotating power-conversion equipment, and operate 12½% more efficiently. Because they have fewer moving parts, maintenance costs are a fraction of what they are with older types of conversion equipment.

GERMANIUM CELLS—The germanium rectifiers used in these new plating power supplies are manufactured by General Electric, and have been thoroughly proved in more than three years of extensive testing and development.

MORE INFORMATION—For more information on the new G-E germanium rectifier power supply, or other G-E metallic rectifier power supplies, contact any authorized G-E agent listed below, or write Section 463-11, General Electric Co., Schenectady 5, N. Y.

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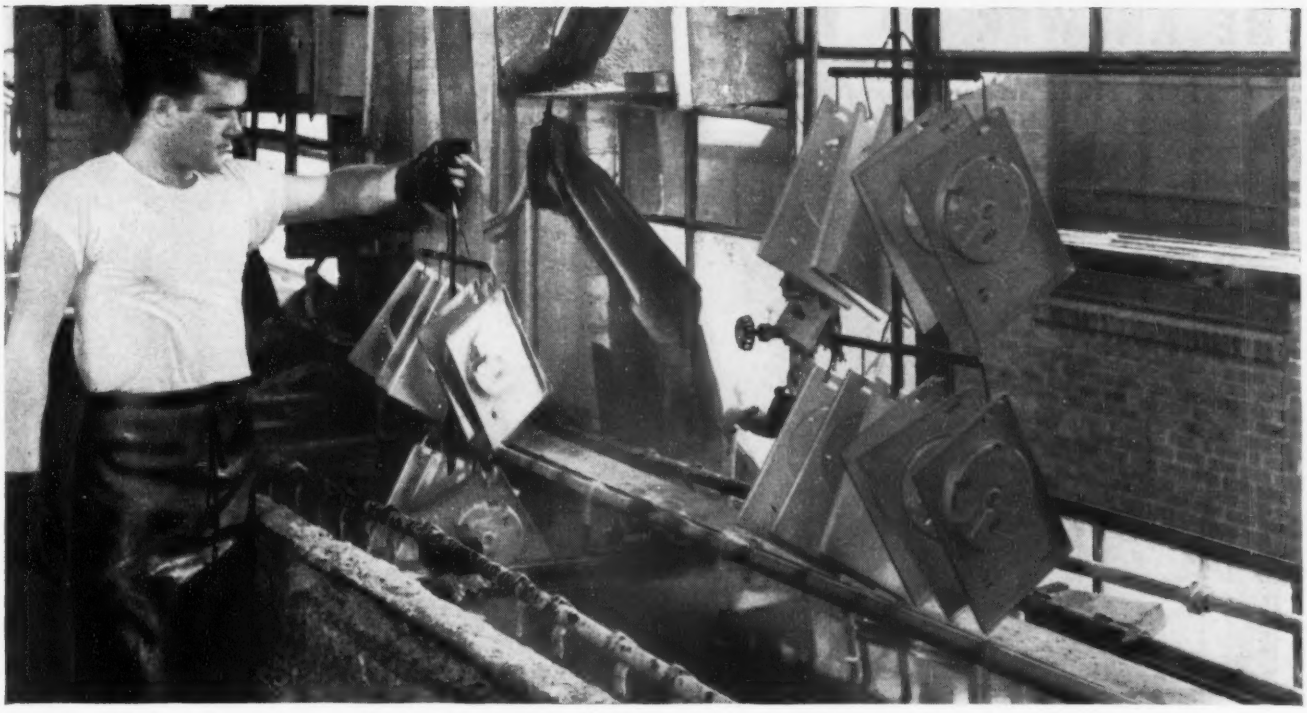

Placing phonograph motor boards in copper plating bath. Plated parts on right are allowed to drain to reduce drag-out.

"Du Pont Coppralyte® gives the speed and throwing power we need for heavy copper deposits"

—Says Edwin McFarland, Supt., Kelly Plating Co.

Plated hubs being removed from rack. Bore is unplated and will be carburized.

"Baths made up with 'Coppralyte' plating salt are economical, too," Mr. McFarland continues. "And they're easy to make up and maintain with the prepared salts. That's why they've been our choice for over 8 years."

At its Cleveland plant, Kelly Plating Co. plates 3,000 bicycle hubs and 3,000 phonograph motor boards per eight-hour shift. The heavy copper coating on the hubs serves as an undercoating for subsequent nickel and chrome plating. A lighter deposit on the motor boards prevents rusting and forms a base for attractive finishes.

Kelly Plating's trouble-free experience can be yours too—whatever your particular copper plating needs may be. You'll find that Du Pont cyanide copper plating chemicals can meet all your requirements for high-quality results and economical operation.

Call your District Office for more information about Du Pont plating processes and chemicals or mail the coupon below.

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†BARADA & PAGE, INC.

® Du Pont's reg. trade-mark for its copper plating salts and addition agents.

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Electrochemicals Dept., MF- 4, Wilmington 98, Del.

Please send me more information on Du Pont Plating Chemicals —properties, advantages and recommended procedures. I am interested in the following types of plating:

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Specify CLEPCO Steel Heaters for all other alkaline tanks.

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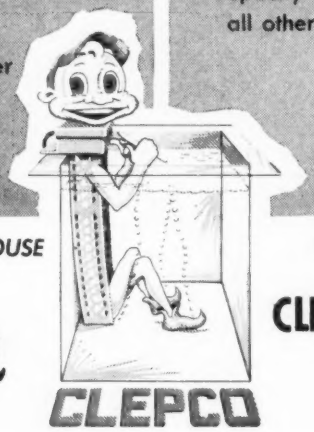

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IN ANY COMBINATION OF TREATMENTS

OUR REPRESENTATIVES AND FIELD ENGINEERS ARE AT YOUR SERVICE TO HELP REDUCE YOUR FINISHING TIME, LABOR AND COSTS

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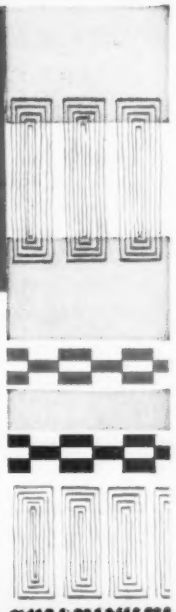
From MEXICO ... and JOE-D

Come the Original BIAS SISAL BUFFS



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The high-quality sisal used in **every** JOE-D Buff is grown and specially woven for JOE-D in Yucatan, Mexico. Top quality raw material is one reason why JOE-D Sisal Buffs are the finest on the market — fast-cutting, long-lasting. And JOE-D's **original** bias construction guarantees **frayproof** performance — never a loose thread end to scratch or mar. Insist on **original** quality . . . specify JOE-D —you can't buy a better buff!

The JOE-D line covers a complete selection of Bias, Bias Sisal, Bias Spoke (Finger) and Conventional Buffs—as well as quality Polishing Wheels.

Holders of the original patent on Bias Sisal Buffs— U.S. Pat. No. 2642706

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the JOE-D Buff Company

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POLISHING LATHES

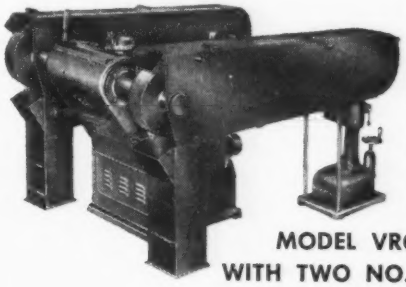
ABRASIVE BELT FINISHING MACHINES

1500 TO 3000
1250 TO 2500
950 TO 1900
RPM INSTANTLY

DIAL CONTROL DOES IT!

MODEL VROL
VARIABLE SPEED

Turn the conveniently located dial and get spindle speed changes from 1500 to 3000 RPM instantly, while lathe is in operation. Model VROL Variable Speed, Ball Bearing, Polishing and Buffing Lathe with a spindle overhang of 8" permits handling of bulky parts without base interference.



Model VRO Variable Speed Polishing Lathe converted into a high production Abrasive Belt Unit by means of two Model 3-R Backstands. Faster, cooler cutting, increased production, more uniform finish are obtained through the use of abrasive belts.

MODEL VRO VARIABLE SPEED
WITH TWO NO. 3-R BACKSTANDS

Two-spindle, two-motor, ball bearing model with motors in base, multi-V-belt drive and 8" spindle overhang. Choice of 3, 5 or 7½ HP motors and independent spindle speeds. Other models up to 25 HP.

MODEL RRO

SINGLE SPEED — TWO SPINDLES

A COMPLETE LINE OF POLISHING LATHES • BACKSTANDS • AUTOMATIC POLISHING ABRASIVE BELT EQUIPMENT ***Write for Catalog***

Hammond Machinery Builders

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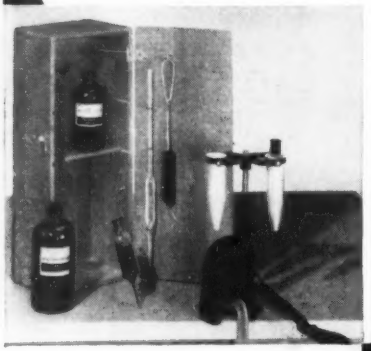
INCREASE YOUR PRODUCTION WITH KOCOUR PLATING TEST EQUIPMENT

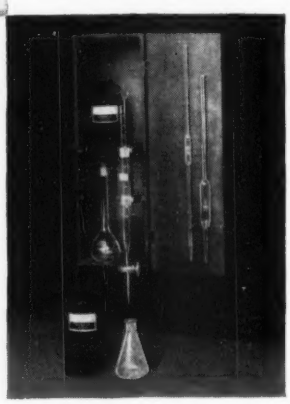


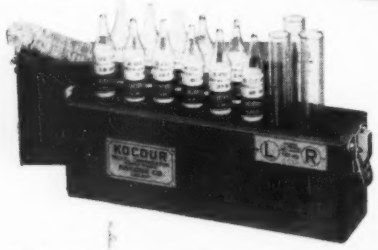
All successful platers know that using KOCOUR plating test equipment means better plating, more production, lower costs, increased profits.

● The KOCOUR Sulfate Test Set enables anyone to accurately and quickly determine the sulfate content of a chromium plating bath in order to maintain a constant check on the ratio of sulfates to chromic acid. . . . This is important to insure consistently good plating results. . . . The entire test takes about 7 minutes . . . no calculations are necessary.

● The KOCOUR Chromic Acid Test Set was designed to accurately and simply determine the chromic acid content of chromium solutions. While a hydrometer is sometimes used for this determination, if close control is desired, the solution should be analyzed.

The set is self-contained . . . reads directly . . . is accurate to the one-half ounce per gallon of chromic acid . . . one simple subtraction is the only necessary calculation.





● Many platers use the KOCOUR Set "CR" for determining trivalent chromium in chromium solutions. The importance of this set is that a chromium solution high or low in trivalent chromium is not only expensive to operate but also is the cause of much spoiled work. The set is simple to operate . . . cost of upkeep small . . . no calculations are necessary.

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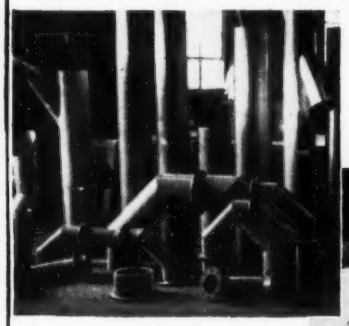

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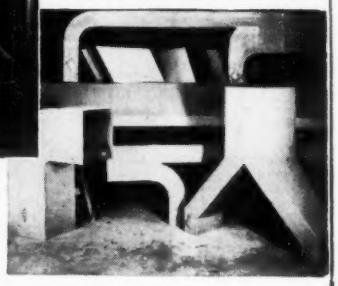

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Stacks, tanks, crocks, dampers, elbows, etc. also fabricated to order. Standard size crocks available in stock.

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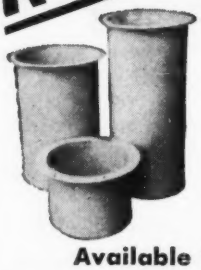

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- **LIGHTWEIGHT**
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12	16"	14"	30.00	27	22"	18"	49.00
15	16"	18"	35.00	30	22"	20"	53.00
20	16"	24"	40.00	55	22"	36"	70.00
30	16"	36"	49.00	73	22"	48"	83.00
40	16"	48"	59.00	55	28"	22"	76.00
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a rich golden plate

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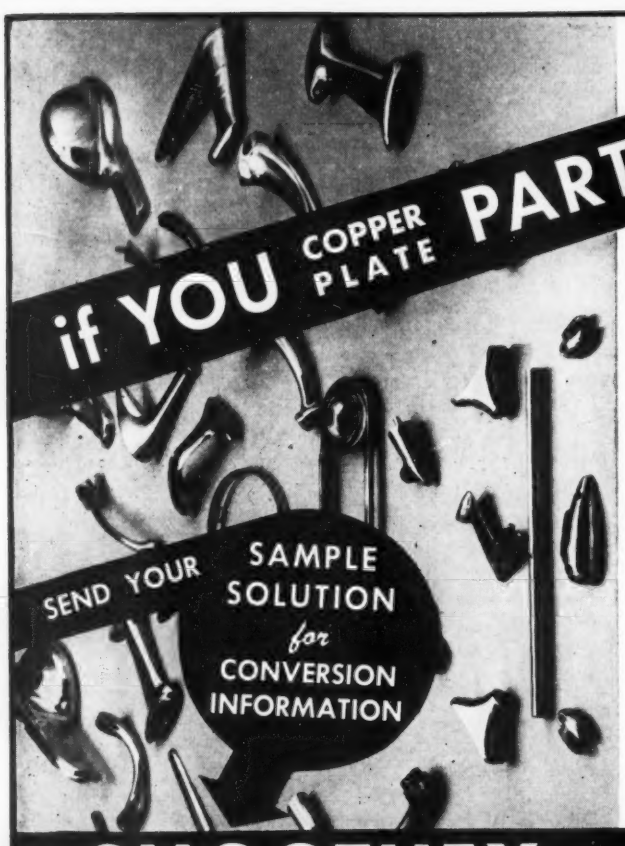

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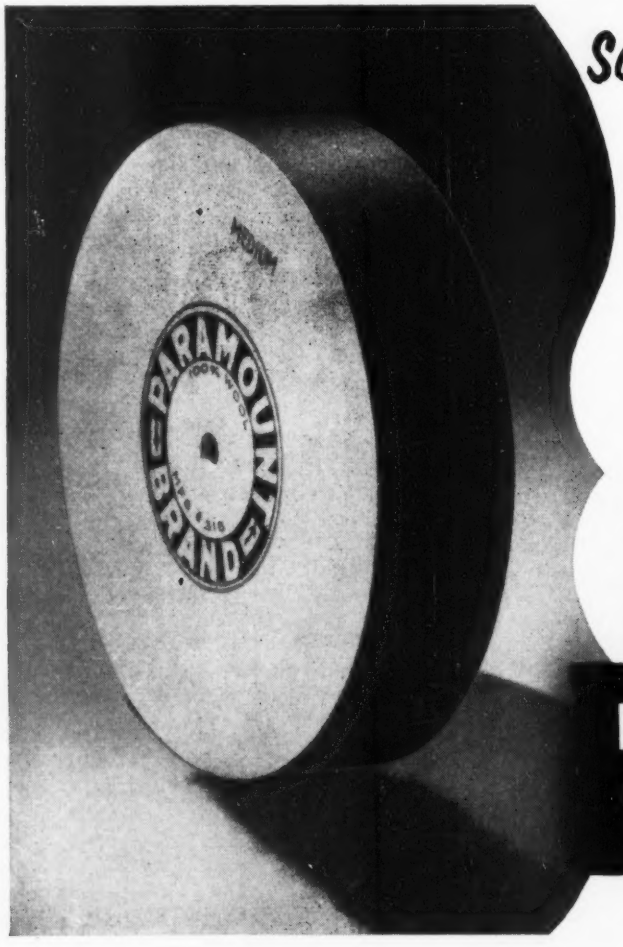

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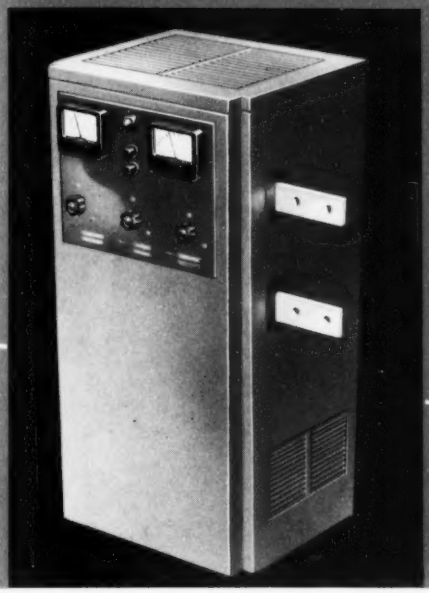

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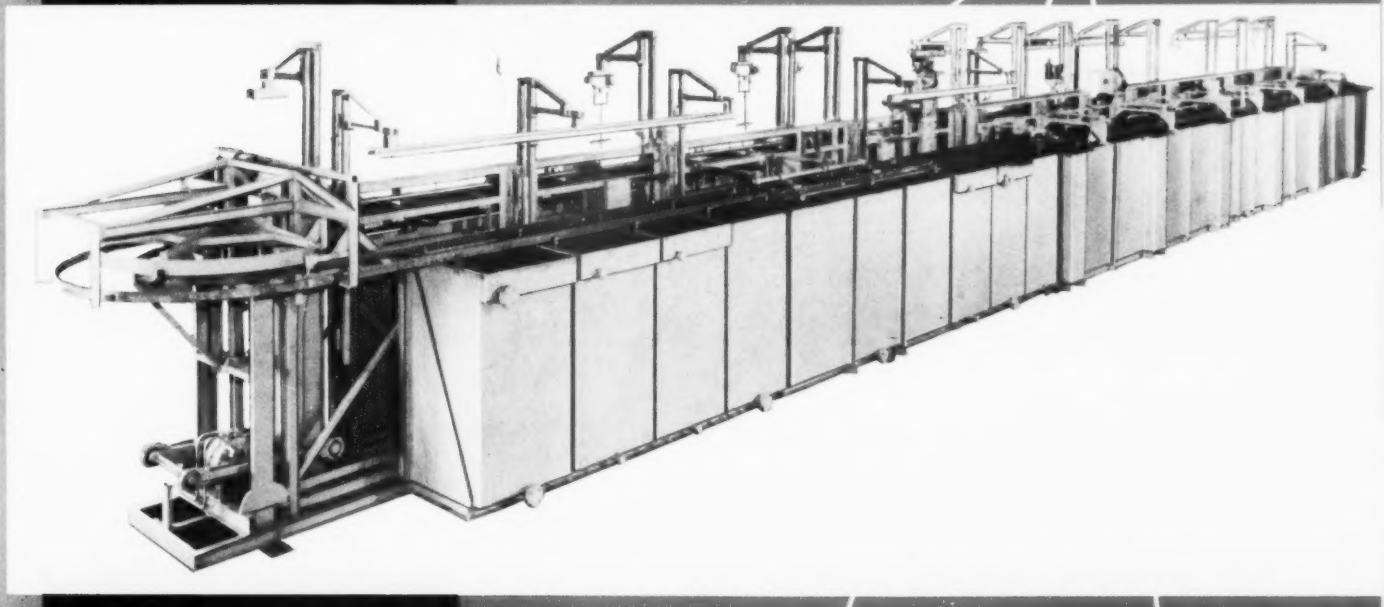

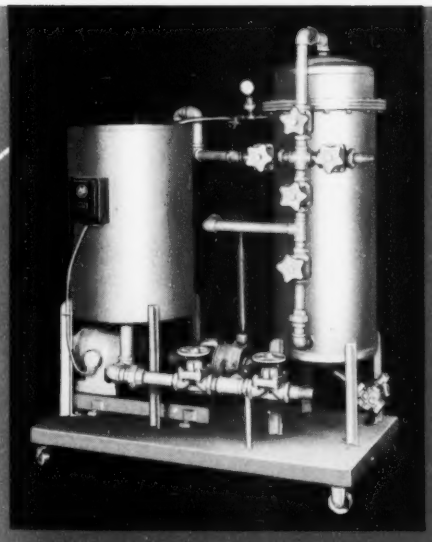

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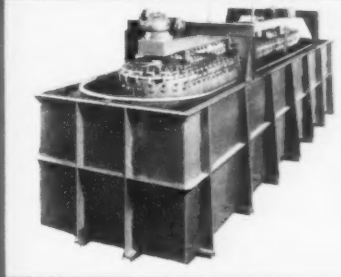

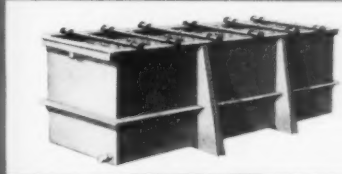

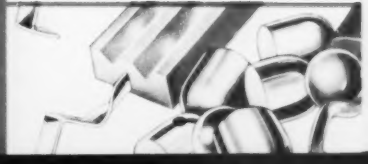

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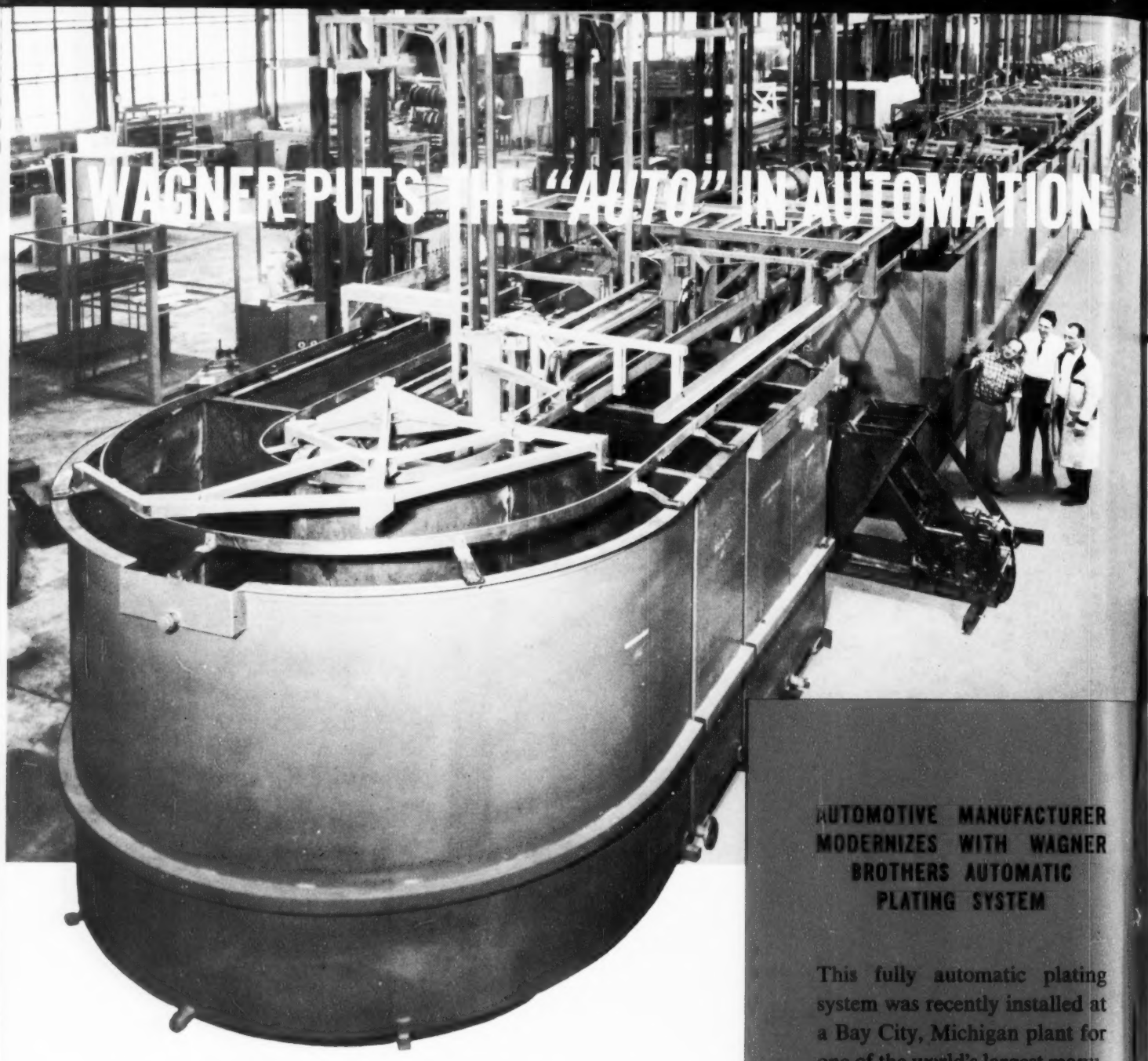


WAGNER PUTS THE "AUTO" IN AUTOMATION

If your metal finishing operations are still being carried on with obsolete equipment which loses money for you every day, we can put you ahead of your competition, increase your profit margin.

Increased production lowers the unit cost of your parts processing operations – you spend less for labor, less for power and increase your capacity to handle more business.

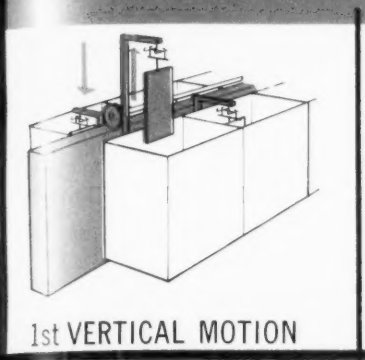
Wagner Brothers Full Automatic* Electroplating systems offer you a new and revolutionary concept in high-volume plating mechanisms – the product of years of engineering research and design refinements – for completely automatic cycling of your metal finishing operations.

*Patents Pending

Basic design details of Wagner Brothers Automatic Plating systems are described and illustrated in Bulletin 50-54, available free upon request.

AUTOMOTIVE MANUFACTURER MODERNIZES WITH WAGNER BROTHERS AUTOMATIC PLATING SYSTEM

This fully automatic plating system was recently installed at a Bay City, Michigan plant for one of the world's largest manufacturers of passenger cars. The unit is 203 feet long, 11 feet wide and operates under 16-foot head-room. Die cast parts are continuously processed through a 40 station copper-nickel-chromium cycle. Production rate is 100 racks per hour, using racks 24″ long, 10″ wide and 64″ deep. Power is furnished by one 25-HP motor. Unit is provided with a push-button central lubrication system, built-in rack stripper, vertical and horizontal agitation. Racks are automatically loaded unloaded.



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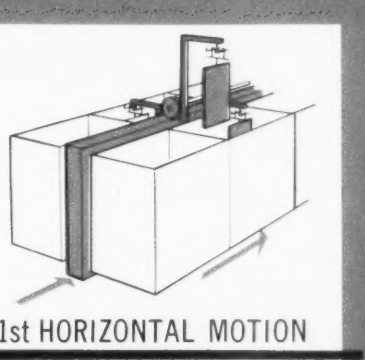
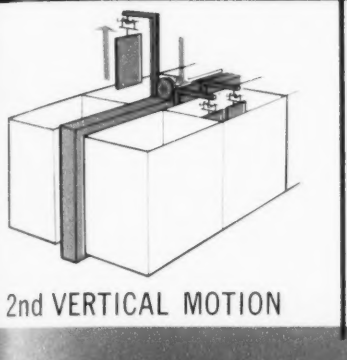
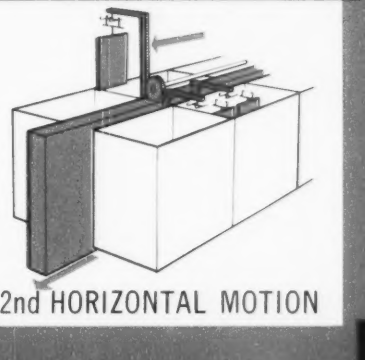


1st HORIZONTAL MOTION



2nd VERTICAL MOTION

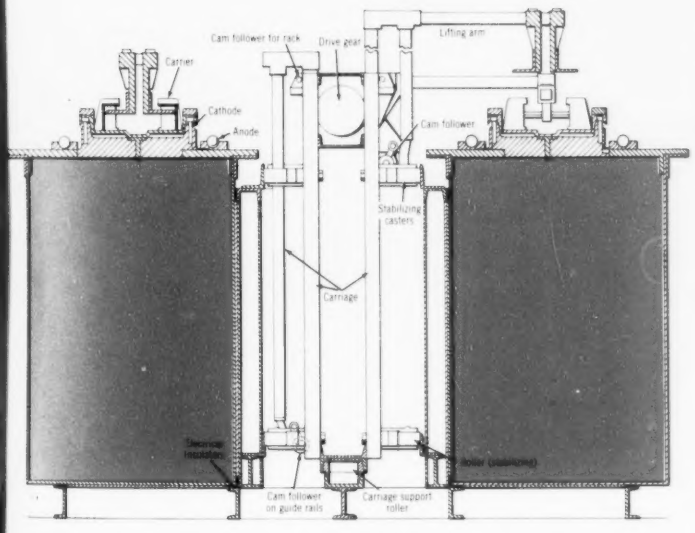


2nd HORIZONTAL MOTION

HOW IT OPERATES

All transfer and conveying mechanism is mounted on a reciprocating carriage located between the two rows of tanks. Two basic movements bring parts through the full plating cycle, one forward and reverse straight line horizontal motion and one raising and lowering vertical movement.

Plating racks are attached to work-carriers at the loading station. When the machine is started, lifting arms fixed to the carriage engage the work-carriers being transfered and lift them at all points on one side of the machine, carry them forward to the next station where they are lowered and disengaged from the lifting arm. Sequence is simultaneously produced in reverse on the opposite side so that, when lifting arms are lowered on one side, they rise on the other side.



The entire carriage mechanism is suspended on rollers moving in an oil-filled channel track. This carriage is motivated by a hydro-motor mounted at the base of the machine, fitted with a crank and link to translate the simple harmonic motion of the motor shaft to the in-line reciprocating action of the carriage.

In addition to high-volume plating, the Wagner Brothers Automatic is equally-well-suited to anodizing (sulfuric and chromic), phosphate coating, etching, electropolishing, oxide coating, etc.

ADVANTAGES and FEATURES

SMOOTH OPERATION – Hydromotor power principle *eases* parts through the plating cycle without jolting starts and stops. Parts never jar from work-carriers into tanks.

LOW POWER NEEDS – Almost perfect balance of work load being lifted at one time requires only *low hydraulic pressures.* One 25-HP motor operates the 203 foot automatic shown.

SIMPLE INSTALLATION – Automatics are delivered to your plant either intact or in 2 or 3 completely assembled sections, depending upon size. *You avoid costly installation.*

MINIMIZED MAINTENANCE – There are fewer moving parts, no vibrating parts, no backlash in automation, low hydraulic pressures, no alignment problems. Overload protection is built into the hydraulic pump. Working parts are easily reached without disassembly.

OTHER FEATURES –

OPERATES UNDER LOW HEAD-ROOM REQUIREMENTS • NO OIL-DRIPPING CONNECTIONS OVER TANKS • TRIPLE CONTACT CATHODE BARS FOR SMOOTH CURRENT FLOW • AUTOMATIC HEAT CONTROL FOR ACCURATE RESULTS • CENTRAL LUBRICATION SYSTEM • EASILY VARIED DRAG AND DWELL TIME

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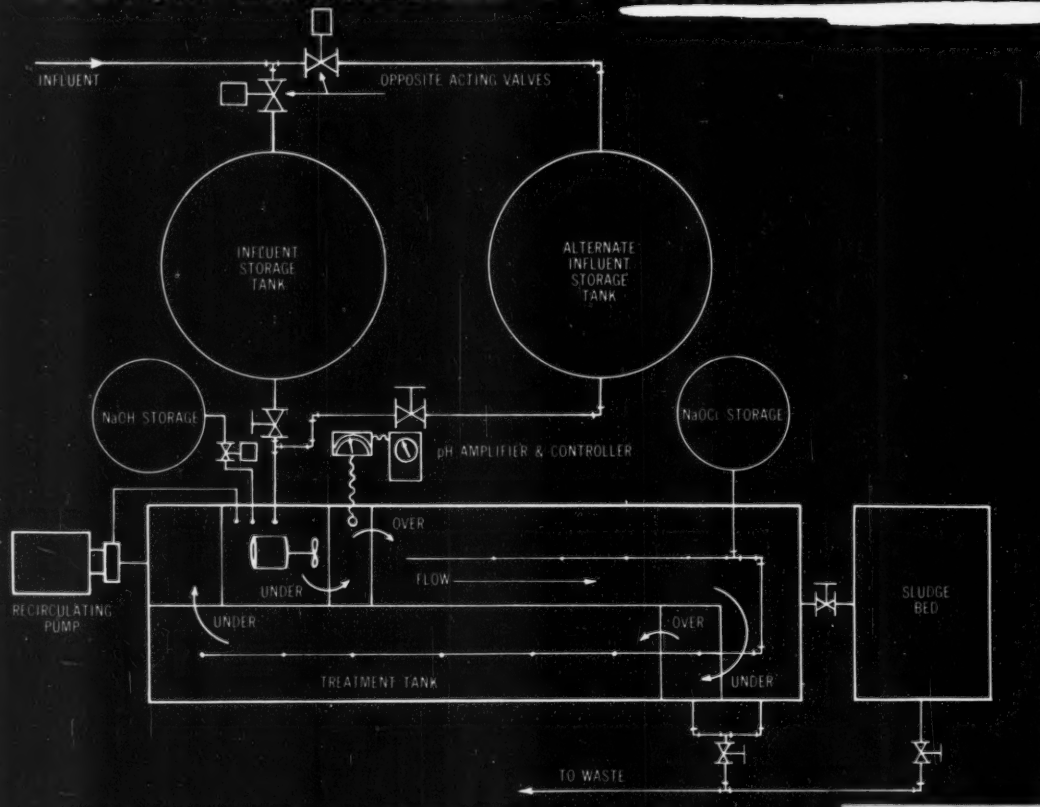
CUSTOM ENGINEERED BY WAGNER BROTHERS



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With Wagner Brothers Waste Treatment systems, you can be sure of *positive, economical* waste treatment requiring a *minimum of operating and maintenance cost.*

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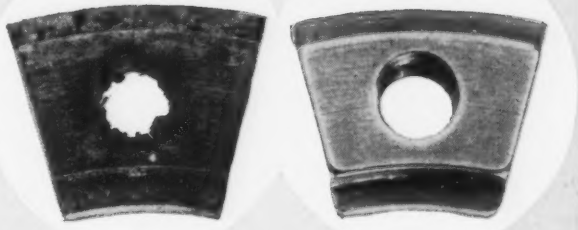

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METAL FINISHING

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The use of potassium oxalate as a complexing agent in the boric acid analysis in nickel solutions.

A method of plotting the variations of covering power with a satisfactory degree of precision, taking into account the factors relating to the base metal and progressively varying the factor concerning the bath.

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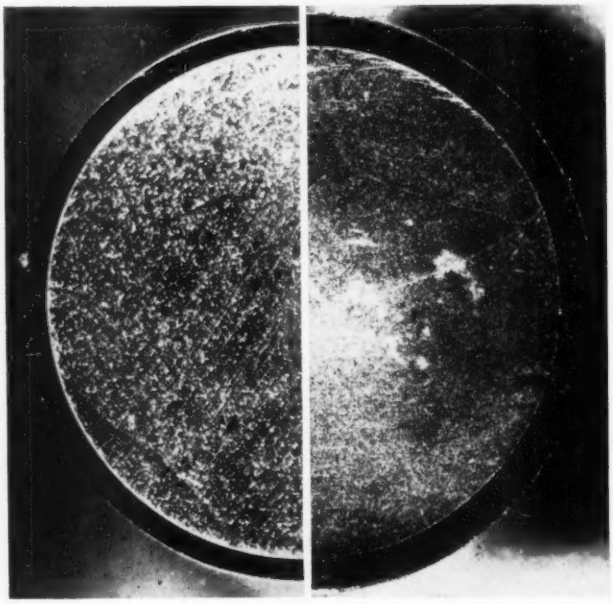
Chromium platers make big gains

More progress reported in plants using Unichrome SRHS® Chromium Plating Solutions



Improved cathode efficiency cuts power need, ups output, saves time. Evidence of higher cathode efficiency of SRHS: Macrograph of steel rod section at left shows 0.016″ of chromium deposited in 16 hours in ordinary solution. Identical rod section at right, plated in SRHS bath under identical conditions, got 0.0225″ deposit — 40% more.

The working advantages of SRHS Chromium Solutions show up in different ways. Here are a number of cases to illustrate.

MATERIALS CONSUMPTION CUT

In one automotive plant, the SRHS bath replaced the ordinary chromium solution in a full automatic, resulting in a decrease of salts consumption from 500 pounds down to 300 pounds daily — saving about $3000 a year on salts alone. This saving was due partly to lower dragout loss from the more dilute solution and to diminished spray loss from the more efficient SRHS solution.

POWER CONSUMPTION CUT

At another plant, SRHS halved power consumption. 4-rack loads of bumper guards now get coverage in SRHS with 2500 amperes, whereas this same load needed 5000 amperes in the ordinary chromium solution. Existing power supplies can gain additional work capacity with Unichrome SRHS Solutions, and platers can save on power, too.

PRODUCTION STEPPED UP

Because of the increased plating speed of SRHS Solutions, work took only 2½ hours in one shop, where 3½ hours had previously been needed in the ordinary solution. Taking advantage also of higher efficiency and wider bright plate range, some plants have put through 30 to 66% more work per *cycle* with SRHS.

More information on these and other benefits derived from Unichrome SRHS Solutions can be obtained from the nearest office of United Chromium. ®*Trade Mark*

Here's undivided responsibility for good plating results

When Unichrome Bright Nickel was unveiled after more than 3 years of operation, the first complete, *matched* set of plating processes became available—Unichrome Copper, Bright Nickel and SRHS Chromium.

Platers can now *unify* their operation, getting three baths that work outstandingly well together; also undivided responsibility for prompt technical help. Downtime drops. Needless expense can be avoided.

Equally important are the extra opportunities for improving output and cutting production costs through the advantages of the individual processes. For example:

A HELP IN PRODUCTION

Special addition agents for Unichrome Pyrophosphate Copper enable platers to get the deposit to suit their requirements exactly. With one agent, a lustrous deposit is produced which can eliminate buffing. With another, a satin finish is produced which is ideal for buffing — permitting buffing of the free flowing copper rather than the steel or nickel.

With Unichrome Bright Nickel, deposits are obtained that are more receptive to chromium and avoid passivity problems. This stable bath also shows greater tolerance for impurities. To users this has meant reduced downtime for purification.

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METAL FINISHING

DEVOTED EXCLUSIVELY TO METALLIC SURFACE TREATMENTS

ESTABLISHED 1903 VOLUME 53 • NUMBER 4 • APRIL, 1955

A Foggy Situation

Call it the salt spray test or the salt fog test, no other development in the field of metal finishing and corrosion prevention has ever come even close to engendering the amount of controversy for which this accelerated corrosion test has been responsible. The arguments pro and con have reverberated for two decades and we have no hesitation in venturing the opinion that the test would have been discarded years ago, except for the lack of a suitable alternative method.

Originally, the salt spray test was quite simple; test panels were exposed in a chamber into which a salt solution was sprayed in amount sufficient to produce a dense fog. Inability to obtain reproducible results led to further study, which indicated that a great many variables were responsible, so that today we are saddled with a test method in which control is required over: composition, concentration, temperature, and pH of the salt solution; pressure, moisture content, purity, and temperature of the atomizing air supply; temperature of the chamber; amount of fog produced, its concentration, and pH; position of the test specimens and method of suspension.

Specifications generally call for the test to be continuous, except for the short daily interruptions necessary to inspect, rearrange, or remove test specimens. Unfortunately, no suggestions are offered the operator who finds that the spray nozzle became clogged at some unknown hour during the previous night or weekend, so that the chamber contained no salt fog. To pile Pelion on Ossa, prospective revisions in the test are expected to include reduction of the salt concentration from 20 to 5 per cent, and also addition of acetic acid to the salt solution.

In any case, recent work by ASTM Committee B-8 has cast doubt on the value of the standard salt spray test procedure B117-49T, in view of the wide divergence of test results. It was found that the test "*does not reliably and reproducibly prognosticate the quality of the finishes under consideration.*" In the case of the sacrificial protective electrodeposits, zinc and cadmium, salt spray resistance requirements have been eliminated from the ASTM specifications, although still continued by government agencies.

Until all parties get together and finally agree on one particular type of test, users of specifications should be warned that "salt spray" is a specification term to be approached with caution and employed with discrimination.

Nathaniel Hall

Do's and Don'ts in Plating Operations

By Charles Bueltman, *The Permutit Company, New York, N. Y.*

THE employment of ion exchange equipment and resins in the metal finishing field has developed to an accepted and general practice. The many installations of ion exchange equipment that have been made have provided a wealth of experience, which serves as a background to consider the "whys" and "wherefores," the economies, and the "do's" and "don'ts" for installation of ion exchange equipment in a metal finishing plant, primarily where the bulk of finishing is of the chrome-plating and anodizing type.

Initially, many of the installations of ion exchange equipment in chrome-plating or anodizing shops were necessary to meet the requirements of the Public Health authorities and avoid the discharging of the toxic hexavalent chromium to the sewer, and eventually into drinking water supplies.

The United States Public Health Service has established a limitation of 0.05 ppm of hexavalent chromium in a drinking water supply.[2] This places a very definite handicap upon shops which have, in the past, made a practice of operating their rinse baths on a once-through system, or of dumping contaminated primary baths when the cation level has built up to the point where inefficient operation results.

Ion Exchange

Ion-exchange has been in use for over 40 years in the treatment of water. The first applications of ion-exchange was for removal of hardness (calcium and magnesium ions) from water.[9] The ion-exchange media employed in the early days could only be "regenerated" with a strong common salt (NaCl) brine, the sodium ion being exchanged onto the resin and then in turn, during the treatment cycle, exchanging the sodium ion for calcium and magnesium.

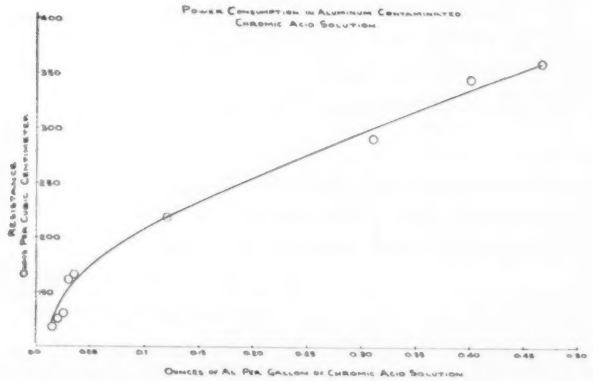

Power Consumption in Aluminum Contaminated Chromic Acid Solution
Resistance Ohms Per Cubic Centimeter
Ounces of Al Per Gallon of Chromic Acid Solution

Figure 1. Experimental results indicating increased electrical resistance due to aluminum build-up in chromic acid anodizing bath.

In the mid 1930's, an ion-exchange media was developed that could be "regenerated" with sulfuric acid, exchanging hydrogen ions for calcium, magnesium and sodium ions in the water being treated.[7,9] The hydrogen thus exchanged reacts with the alkalinity in the water being treated to form carbon dioxide and water. The advent of more stringent requirements for treated water supplies was met with the development of a weakly basic anion exchange resin capable of absorbing strong acids such as hydrochloric and sulphuric acid. Thus, this weakly basic action resin was coupled with the sulfuric acid regenerated cation resin to produce a demineralized water.[9]

In the late 1940's, a highly basic anion resin was developed which would not only absorb the strong acids but also weak acids such as carbonic acid and silicic acid.[7,9,18] With the development of the highly basic anion resin and more efficient acid regenerated cation resins, a highly demineralized water can be produced from an ion-exchange treatment plan.

The development of the highly basic anion type exchange resin with resistance to the high oxidizing effect of chromic acid was a tremendous spur to the practical employment of ion exchange resins for treating the rinse waters from chromic acid processes.[7,16] The development of this type of anion exchange resin made it possible to collect the rinse waters from a chromic acid anodizing or plating process and to treat these rinse waters in the anion exchange unit, for the removal of the hexavalent chromium ion.

The initial installation of this type of equipment was intended for the flowing rinse waters to pass through the anion exchange unit and pass directly to the sewer free of the hexavalent chromium ion. However, when the hexavalent chromium has exhausted the exchange capacity of the resin, it must be regenerated off the exchange resin to renew its capacity for removal of further hexavalent chromium ions from the flowing rinse waters. This is performed by the addition of a dilute solution of sodium hydroxide, resulting in a regenerant effluent from the anion exchange unit consisting of a dilute sodium chromate.[16] The resulting sodium chromate was not reusable in the anodizing or plating process. Consequently, a cation exchange unit containing the styrene type resin regenerated with 66° Bé sulfuric acid was installed for converting the sodium chromate to a dilute chromic acid, after concentration to the proper levels, for addition to the primary bath.

Closed System

It did not take long to realize that, with passing of the flowing rinse water through both the anion and cation exchange units, a highly purified demineralized water resulted.[17] Rather than dump this valuable water to the sewer, it was conducted back to the flowing rinse tanks for reuse in the rinsing operation. The result of this step was the development of a closed system which avoided the possibility of misoperation of the ion exchange units causing the discharge of hexavalent chromium to the sewer.[16]

A further benefit of the closed system was the reuse of demineralized water in rinsing. The employment of this demineralized water, free of dissolved solids, avoided the difficulty previously found with water stains due to the dissolved solids contained in the water formerly employed for rinsing. Sealing rinses, with hot water, were greatly enhanced by using de-ionized water which eliminated the sealing in of small amounts of dissolved solids under the film of oxide.[17]

Briefly, when a plating shop must consider some type of treatment purely to eliminate a waste disposal problem, there are now two avenues of approach available. The first, and the one which has been used for many years, is the batch-wise destruction of the contaminated primary baths and rinse waters.[10] The second, which is now available with a background of four years of practical operating experience, is the ion-exchange treatment of the contaminated effluents discharged from the metal-finishing shop. Practical operation of ion exchange equipment has proven this method to be the more economical of the two in many instances.

Ion Exchange Treatment

The first commercial application of ion-exchange equipment involved the use of a cation exchange unit employing a polystyrene resin for the removal of contaminating cations from a chromic acid plating bath.[1,3] When a chromic acid bath is in use, a portion of the hexavalent chromium is reduced to the trivalent form. There is a build-up of metallic cations from the base metal and undercoats of other metals such as copper and nickel are applied to the base metal prior to the application of the chrome plate. In anodizing, an actual removal of a portion of the base metal occurs as these metallic cations build up in concentration, the electrical efficiency (Fig. 1) of the process drops off and the quality of work produced becomes affected.[8] Standard practice has been to "push" the bath to the limit and then do one of two things. Either "bail out" method dilutes the metallic contaminants, the second method just gets rid of the whole bath.[11]

Either of these methods become very expensive, especially in view of the present cost of chromic acid. A cation exchange unit can be used to great advantages in this instance. Each cubic foot of cation resin has a "capacity" to remove a definite number of pounds of metallic cations from the bath by exchanging hydrogen cations for them.[5,6,9,13] Thus, the cation exchanger "revivifies" chromic acid baths without the wastage of chromic acid as is done in the bail-out or complete dump method.

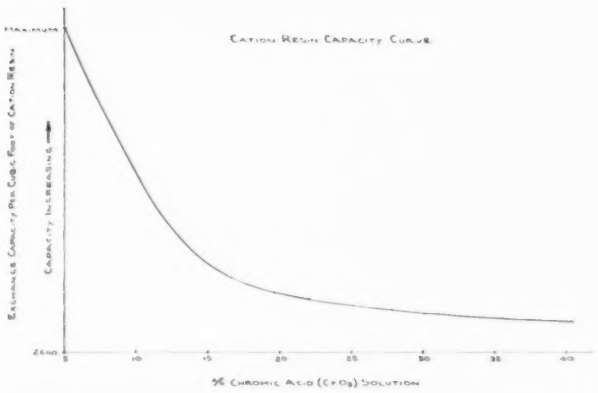


Figure 2. Decrease in exchange capacity of cation resins for removing metals as concentration of chromic acid being treated increases.

What Size Unit?

The size of the cation exchanger required depends primarily upon the pounds of metallic cation build-up in a predetermined time period such as per shift, day or work week. A portion of the "contaminated" bath containing the equivalent of the cation build-up in the time period selected, is then passed through the cation exchanger, for removal of the metallic cations, the "revivified" solution being returned to the bath. With the use of a cation exchanger, the life of a chromic acid bath may be extended almost indefinitely.

Make-up of raw chrome acid is only required for replacing that which was plated out on the parts, dragged-out or reduced to the trivalent state. However, do not expect all chromic acid baths to be able to be treated directly in the cation exchange unit. Cation exchange resins now commercially available are subject to attack by chromic acid when the acid is present in concentrations in excess of 110 grams/liter.[14] Thus, baths with higher concentrations of chromic acid must first be diluted prior to treatment in the cation exchanger and must then be re-concentrated prior to addition of the revivified solution back to the metal finishing process.

Most anodizing operations do not have to consider this dilution and reconcentration because anodizing baths are generally operated at chromic acid concentrations below 110 grams/liter.[14] However, in plating and stripping operations (the same principle of cation exchange is applicable to chrome strippers) the baths are usually in excess of the 110 gram/liter chromic acid concentration. The requirement of dilution and reconcentration through evaporation can increase the cost of operation to over-balance the savings realized in chromic acid recovered.

In a paper recently published[14] it was pointed out by one resin manufacturer that a cation resin had been developed which can withstand attack by chromic acid in solutions containing as high a concentration as 400 grams/liter of chromic acid. This increased resistance to attack over such a broad range certainly makes it feasible to investigate the possibilities of employing this resin. A recent check indicated that the resin had proven itself through the pilot plant stage and the manufacturer was investigating full scale production. If commercial availability of this resin becomes a reality to the metal finishing industry, it should be a great

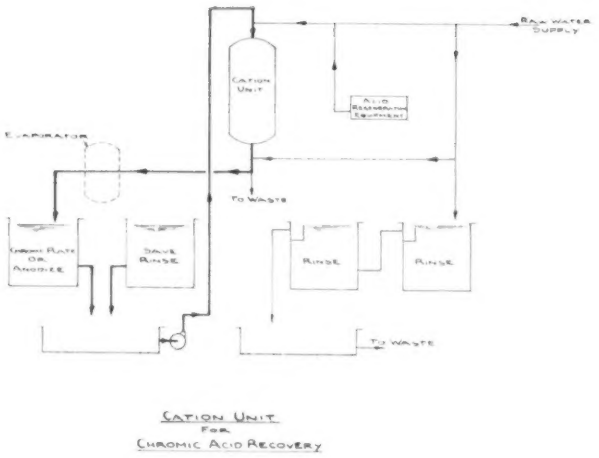


Figure 3. Flow diagram illustrating cycles involved when cation exchange unit is employed to treat "strong" chromic acid solutions for metal removal.

boon to large scale users of strong chromic acid solution such as platers, strippers, etc. Solutions contaminated with metallic cations can then be treated directly in the cation exchange unit without the necessity of introducing a dilution stage and the investment in an evaporator for re-concentration of the solution.

Investigation of the use of this resin indicates that the same exchange capacity phenomena exists as with cation exchange resins now commercially available. That is, as the concentration of the chromic acid solution to be treated increases, the capacity of exchange per unit volume of exchange resins decreases (Fig. 2). However, the quantity of regenerant chemical for a cation exchange resin, usually 66° Baumé H_2SO_4, remains the same. Consequently, the cost to remove one pound of cation metals from a 250 gram/liter chromic acid solution can be as much as five times that of removing one pound of the same metal from a 50 gram/liter chromic acid solution.

Considerations Before Installation

A metal finishing plant, investigating the possibility of installing a cation exchange unit, must determine several facts before it can be determined just which method, dilutions, treatment, concentration, or direct treatment with return to the bath will prove most economical. The metal finishing shop must know for each bath:

(a) the rate of build-up of cations in the solution per unit of time, preferably per shift, day or week;

(b) the concentration of free chromic acid maintained in the bath;

(c) the allowable concentration of cations that may be maintained in the bath and still maintain high quality work from the bath and high electrical efficiency.

The items outlined in (a) and (b) above, will determine the quantity of resin required to remove the metallic cation build-up over the period of time selected. Naturally, the shorter the interval of time selected, the lesser volume of resin will be required with a subsequent smaller investment in ion exchange equipment.

Operating time of the ion exchange unit must be kept in mind. Depending on the type of the ion exchange equipment, there is a "regeneration" time of one to two hours required. In addition, there is the time required to treat the chromic acid solution in the ion exchange unit. This time is highly variable, dependent entirely upon the volume treated in each cycle. Usually, one can anticipate a three to four hour cycle during which time an operator must be in almost constant attendance at the equipment. Thus, the more frequently an ion exchange unit is regenerated the higher is the investment in operating personnel cost.

Automatic or semi-automatic operation of the exchange equipment can be considered thus reducing the operating personnel time but again the increased first cost for this feature must be considered.

Let us consider the cation exchange resins now commercially available, that is the resin resistant to chromic acid concentration of 110 gram/liter or less.[14] Anodizing baths and other chromic acid solutions which are maintained at concentrations lower than the maximum limit tolerated by the cation resin do not present the problems that stronger chromic acid baths present.[8] Since it is necessary to dilute the stronger baths prior to their treatment in the cation exchange unit, the object is to minimize any subsequent dilution in the passage of the solution being treated through the ion-exchange resin thus reducing to a minimum the subsequent cost of evaporation equipment and heat costs.[2]

The accepted practice in passing solutions through ion-exchange units is to pass the solution "down-flow" through the resin (Fig. 3). However, where the volume of solution to be treated in one cycle is small enough to warrant, the solution may be introduced "up-flow" into the resin bed and then drained from the unit after adequate contact time to permit the ion-exchange reacions to take place (Fig. 4).

Sweetening On

In the down-flow treatment of chromic acid solution, the designers of ion-exchange equipment take every precaution to avoid excess dilution in the introduction and removal phases of the solution in the resin bed. The introduction phase is commonly known as "sweetening-on" and the removal phase is called "sweetening-off." This terminology is a carry over from one of the first installations of "non-water treatment" ion exchange equipment, especially in the sugar refining industry where the term sweetening on was used to designate the introduction of sugar-bearing solutions to the resin bed, and sweetening-off being the converse or removal of sugar-bearing solutions from the resin bed.

In an ion-exchange unit, the resin bed generally occupies only the lower 50 per cent to 70 per cent of the straight side of the ion-exchange tank. The remaining 30 to 50 per cent is maintained as the free-board or rising space required to allow for expansion of the resin bed due to inherent swelling of the resin or expansion of the whole bed during the backwash phase of the regeneration cycle. (Backwashing — is an upward flow of water through the resin bed to loosen and regrade the bed to prevent undue packing of the resin and to cleanse foreign matter from the resin bed

that might accumulate during the treatment phase of the ion-exchange cycle.[9]

It is easy to visualize in a down-flow treatment unit (Fig. 3), that if the chromic acid to be treated is introduced to the ion-exchange unit through the top head considerable dilution of the first portion of solution introduced will result because of mixing with the bell of water present above the bed of ion-exchange resin. One equipment manufacturer has circumvented this problem by introducing the solution to be treated through a distributor located immediately above the ion-exchange resin bed (Patent #2,466,662). The slightly higher specific gravity of chromic acid solutions cause them to flow out over the resin bed and then, with a minimum of mixing with the bell of water to the rising space of the unit, pass down through the resin bed and thence to a holding tank, evaporator or back to the metal finishing process from whence it originally came.

This manner of introducing the solution to be treated to the ion exchange unit is the "sweetening on" phase of the treatment cycle. After sweetening on, the remainder of the solution is passed through the resin until sufficient volume has been passed through the resin to exhaust the exchange capacity of the resin volume or until all of the solution to be treated has been introduced to the ion exchange unit.

The next phase of the treatment cycle is the backwash step, the products of which are discharged to the sewer. Due to the health authorities' restrictions,[2] it would be prohibitive to permit backwash water containing an excess of chromic acid to be discharged to the sewer. Thus, it is necessary to remove as much of the chromic acid remaining in the unit as possible, prior to the backwash step; this is accomplished through the sweetening-off step previously mentioned. Also a correctly controlled sweetening-off step limits the dilution that occurs through the forcing of the remaining chromic acid from the resin bed with water.

Sweetening Off

The sweetening-off water is introduced to the top head of the ion-exchange unit and passes down through the rising space at the same time forcing the remainder of the solution in the resin bed on to the holding tank, evaporator, or process tank. The resin bed aids in uniform distribution of the solution in the bed, thus minimizing the amount of dilution that occurs in this phase.

After the sweetening-off step, the ion-exchange unit is then ready for back-washing. Despite all of these precautions and design features the ion-exchange equipment manufacturers still find that there is a further dilution of the chromic acid solution of approximately 20 per cent.[14] Consequently, if an evaporation stage is necessary for reconcentration, the additional dilution of the solution treated must be anticipated and allowed for in the design of evaporator capacity. If the evaporation and drag-out losses from the metal finishing process are of sufficient magnitude, the additional dilution may serve as a means for making up for these losses.

The "up-flow" ion exchange unit illustrated in Fig. 4 is another approach to minimizing the dilution encountered during sweetening-on and off. However, this method is applicable only where the metallic cation concentration is allowed to build up to very high limits, thus requiring a small volume of exhausted chromic acid solution to be in contact with the resin bed to exhaust the exchange capacity of the resin. The primary advantage of up-flow treatment as against down-flow treatment is that the dilution resulting from the sweetening-on step in down-flow treatment is eliminated.

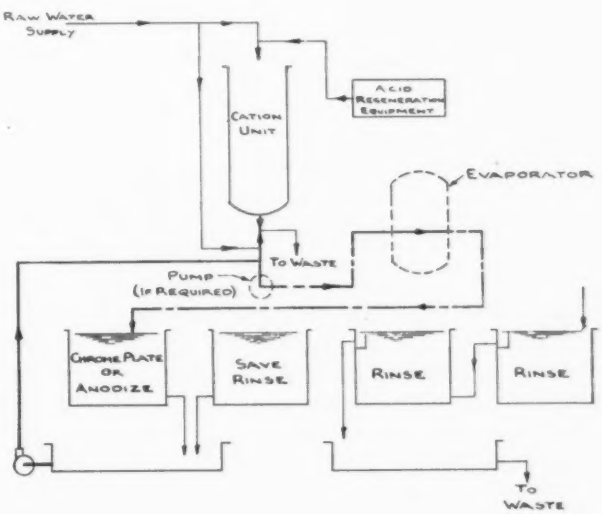
Costs and Savings

Thus far we have discussed only the application of a cation exchange unit to the treatment of plating baths, rinse solutions, anodizing baths and stripping solutions. Reference to the curve in figure 1 points out the gain in electrical efficiency by maintaining a relatively low concentration of metallic cations in the bath. The curve in figure 1 is not a theoretical curve but one extrapolated from experimental data.[3]

Another advantage to cation exchanger treatment of these baths is the economy of being able to reuse the primary solutions over and over again. This saves the amount of valuable chromic acid that would otherwise be wasted due to bailing out or dumping of the bath as would be required if cation exchange treatment of the bath were not practiced.

Balanced against these economical advantages are the costs of 1) regenerant chemicals, 2) dilution water, and 3) evaporation heat. The cost of 1) regenerant chemicals is a ratio of the amount of cation contaminant in the bath being treated.

Referring to the curve in figure 2, it will be noted that, if the bath to be treated is at a concentration of 5% CrO_3 or less, the maximum exchange efficiency per unit column of resin may be obtained. Using the average "exchange capacity" rating of commercial



Cation Unit
For
Chromic Acid Recovery
Of
Upflow & Drain Cycle

Figure 4. Cycles involved when cation exchange unit is employed to treat "strong" chromic acid solutions for metal removal wherein the volume of solution being treated is almost the same as the volume of resin required to treat the solution.

cation resins to remove a pound of cations, expressed as calcium carbonate, from a bath would require approximately five pounds of 66° Bé sulphuric acid. At a current market cost of 2.5c per pound for carboy lots this represents an investment of 12.5c in acid regenerant.

Assuming that a plating bath is maintained at a 52 oz./gal. CrO_3 level and a maximum cation level of 2 oz./gal. is permitted, it would take 8 gallons of bath solution to make up the one pound of metallic cations. In the 8 gallons of bath solution there is an investment in 416 oz. of CrO_3 at an approximate value of $7.80. Thus, a net chemical cost saving of approximately $7.65 is realized.

However, this does not represent the actual net savings for there is a further investment in dilution and regenerant water and evaporation steam to reconcentrate the solution. The additional cost for these items is entirely dependent upon the amount of dilution required prior to ion exchange treatment and the degree of re-concentration desired prior to addition of the treated solution to the primary bath.

The amount of savings in recovered chromic acid is reduced somewhat if the solution to be treated is at a ten per cent concentration of CrO_3. In this case, to remove one pound of cations expressed as the calcium carbonate equivalent, requires approximately eight pounds of sulphuric acid at a cost of 20c. However, the amount of dilution water and heat required is considerably less and counter-balance the higher investment in regenerant acid.

The employment of a cation exchange unit for "revivifying" strong chromic acid solutions (plating, anodizing, and stripping baths) represents the most economical usage of ion-exchange equipment in the metal finishing field. The use of anion exchange resins to remove chromic acid from recirculating or overflowing rinse waters is a break-even proposition. In general, the resin manufacturers "rate" the anion resin materials employed for this service at a capacity of approximately two to two and one-half pounds of chromic acid, CrO_3, per cubic foot of the anion resin.

When the anion resin has "picked up" or exchanged the equivalent of this amount of chromic acid, the resin is then exhausted for further exchange capacity. A dilute caustic solution is then applied to the anion resin to remove the CrO_3 from the resin, with a resultant effluent from the anion exchange unit of a dilute solution of sodium chromate.[16] The sodium chromate solution resulting from this operation is generally not desirable as a make-up to the various primary baths in this form but would be useful if available as chromic acid.

The conversion from sodium chromate to chromic acid may be accomplished by passing the sodium chromate effluent from the anion exchange unit through a cation exchange unit. In the cation exchange unit, the cation resin will exchange hydrogen ions (H^+) for the sodium (Na^+) of the sodium chromate reforming chromic acid.[16] This procedure requires an additional investment in sulfuric acid to regenerate the sodium off the cation resin and to provide hydrogen ion for

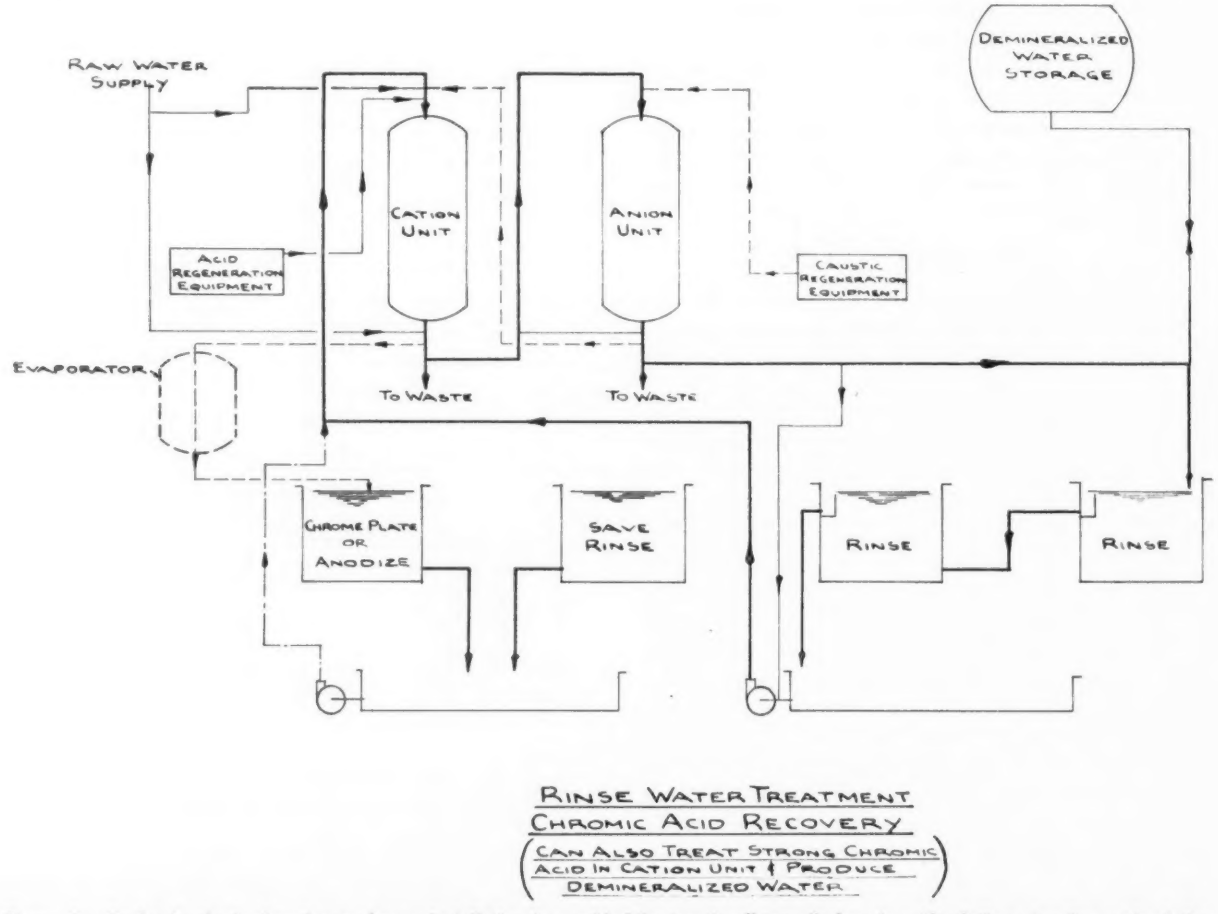


Figure 5. Cycles involved when ion-exchange installation is provided for treating "strong" chromic acid solutions, treating recirculating rinse waters, and production of demineralized water.

exchange with the sodium in following treatment cycles.

Again assuming a cost of 2.5c per pound of sulfuric acid and a cost of 4c per pound of caustic, the cost of these regenerant chemicals will be approximately 25c to 28c to reclaim a pound of chromic acid. With chromic acid available on the market at an average cost of 30c per pound it can readily be seen that we are talking about a very low margin of profit on this operation.

Although the employment of anion exchange resins for the reclaiming of chromic acid from flowing rinse waters is not a "highly" profitable operation,[15] there are many benefits obtained that do eventually appear in the profit column of the metal finishing room operation. The most outstanding benefit obtained from this operation is that the recirculating rinse stream is a closed system. All chromic acid bearing solutions are kept within the confines of the metal finishing room. In locations where the Public Health authorities have placed restrictions on the discarding of chromic acid as a plant waste, a system is available to permit complying with the requirements.

Up until the time that ion-exchange became available for this market it was necessary to resort to "batch-type" destruction of the hexavalent chromium ion.[10] The batch destruction method is very costly in comparison with ion-exchange recovery for, to destroy one pound of chromic acid worth 30c, requires about 20c worth of destroying chemicals for a total cost of about 50c per pound of chromic acid, as the hexavalent chromium is destroyed and not available for re-use in the plant. In comparison, with ion-exchange the chromic acid is recovered for re-use at a cost comparable to that of fresh chromic acid. Consequently, no financial loss is suffered through the ion-exchange system. Reference to figure 5 illustrates the closed system.

Production of Demineralized Water

Another outstanding benefit realized from the closed system is that the effluent from the ion-exchange battery is demineralized water.[17] Demineralized water is a highly deionized water comparable to distilled water. The benefits of using demineralized water are not benefits upon which an immediate dollar value may be placed. The outstanding benefit is the reduction of rejects that usually result from water stains, deposits of precipitates and many of the other difficulties that are inherent with the use of a high solids content water for rinsing operations.[71] Buffing requirements are greatly reduced on bright finishes.

The use of demineralized water for making up the primary baths reduces the introduction of additional variables. The effect of many of the common contaminants present in raw water upon the action of primary baths has occupied many written pages and occupied the time of many platers in attempts to eliminate the contaminants that were causing the production of poor finishes.[17] The source of many difficulties can be eliminated through the use of demineralized water. Since water is one of the predominant factors in metal finishing, the minimizing of introducing variables from this source simplifies the control of the process.

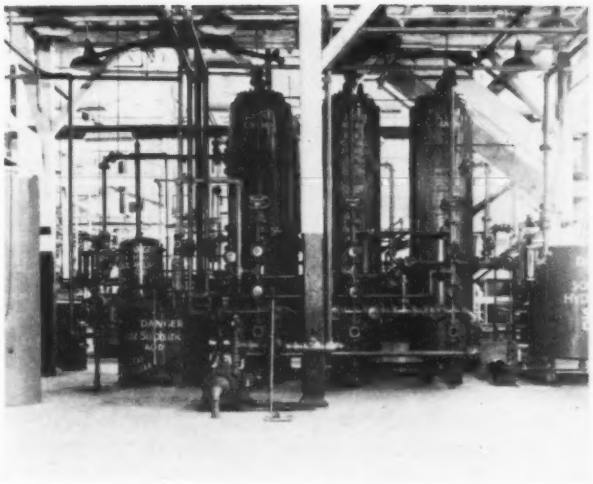


Figure 6. Installation of ion exchange equipment in a mid-west aircraft manufacturer's anodizing room for treating anodizing baths, recirculating rinse water, and production of demineralized water.

In metal finishing plants that have installed ion-exchange equipment for treating the flowing rinse waters, the consumption of raw water has been reduced markedly. Since the rinse waters are recirculated, the only raw water that is introduced to the system is that required to make up for evaporation losses and dragout losses. The introduction of counter-current rinses and save rinse tanks reduces the load chemically and flow rate wise on the ion-exchange equipment.[4, 11]

With the introduction of ion-exchange equipment, save rinse tanks, counter-current rinse tanks and recirculating rinses through the ion-exchange equipment, the makeup of raw water to the flowing rinse stream is reduced to 2% to 10% of the recirculation rate. In a plant where the total flowing rinse rate is 50 gallons per minute, the makeup rate will be between 1 to 5 gallons per minute.

Layout of Equipment

The most economical employment of ion-exchange equipment is obtained through the use of save rinse and counter-current rinse tanks.[4, 11] The size of ion-exchange equipment is based upon two basic facts. The first is the flow rate the equipment is to handle.[9] Most ion-exchange equipment manufacturers have maximum rates at which solutions may be passed through the ion-exchange resin bed. This rate is restricted by the resin bed area and, for rinse waters, is usually about 6 gallons per minute per square foot of bed area. Thus, a 24" diameter ion-exchange unit with an area of 3.17 sq. ft. can treat a maximum of 20 gallons per minute of rinse water. Therefore, in order to employ the minimum diameter ion-exchange unit, it is wise to reduce to a minimum the recirculating rate of the rinse water. This is best accomplished through the use of counter-current rinses which provide the maximum rinsing efficiency with a minimum consumption of water.[4]

The second basis for sizing ion-exchange is upon the quantity of ions, such as CrO_3, that are to be removed from the rinse stream in any selected unit of

time, since a cubic foot of anion resin is limited to the removal of 2 to 2½ pounds of CrO_3 introduced with the recirculating rinse stream in the unit of time selected.

The same features of balancing the investment initially required for ion-exchange equipment and investment in operating personnel time discussed under cation exchange resins must be considered here. In general, it takes approximately 2½ hours to regenerate an anion-exchange unit. If the sodium chromate regenerant effluent is to be reformed to chromic acid in the cation-exchange unit, regeneration time for the cation unit must be allowed for also. The total time for regenerating an anion and cation unit is about 4 hours. Consequently, it is generally advisable to invest in ion-exchange equipment capable of treating the flowing rinse waters for several days or a week at a time and reduce the relative total outage and regeneration time for the equipment.

The equipment illustrated in figure 5, as well as treating rinse waters from chrome plating and anodizing operations, may be employed to treat rinse waters from proprietary chromate conversion processes. The anion exchange unit will remove chromic acid as well as other anion constituents from the rinse water and the cation exchange unit will remove metallic cations, producing a demineralized water for return to the rinsing tanks. However, as in the case of treating chrome plating or anodizing rinse waters, exhaustion of the anion exchange unit cannot be determined by color appearing in the effluent of the unit.

In the actual operation of ion exchange units on chrome plating or anodizing rinse waters, exhaustion of the anion units is usually determined by color appearing the effluent of the exchange unit. Chromic acid will start to color the effluent in the concentration range of 8 to 10 parts per million, thus supplying a convenient visual means of determining exhaustion of the anion exchange unit.

However, when rinse waters from chromate conversion processes are being treated in ion exchange equipment, the anion resin will remove its capacity for anions prior to the time sufficient chromic acid slips through the resin bed to the color the effluent of the ion exchange equipment. Thus, conductivity measurements are required to determine exhaustion of the anion resin. When the anion resin approaches exhaustion, anions will slip through the resin bed in increasing quantity; thus the conductivity of the effluent solutions increases. Consequently, when the conductivity of the treated effluent starts to increase, the anion unit is exhausted and requires regeneration.

Chromic acid is "held" tighter to the anion resin than are the other anions commonly found in proprietary compounds such as chlorides, sulphates, fluorides, phosphates, etc. When the anion resin is exhausted with a combination of the foregoing including chromic acid, continued treatment of flowing rinse waters containing these ions will cause the displacement of the more loosely held anions (fluoride, phosphate, and sulphate — in that order) from the resin. The resin will still pick-up the chromic acid radical but, if operation of the anion unit is continued until chromic acid does break-through, all of the other anions previously picked up by the resin will have been returned into the solution. This certainly is not desirable, especially where any amount of chloride may be present, for chloride is a particularly troublesome constituent and has harmful affects on many types of finishes.[17]

Setting Up The System

When setting up the piping and floor drainage system for a metal finishing room, it is desirable to segregate into three separate drainage systems the rinse water drainage from the various metal finishing processes. A separate drainage system should be provided for all rinse waters from chromic acid baths and rinse waters. In this way, contamination of the chromic acid collected on the anion resin with other anions is maintained at a minimum. A high quality chromic acid can then be obtained upon regeneration of the anion resin.

A separate system should be provided for cyanide baths and rinses,[12] and a third drainage system should be provided for miscellaneous acids and alkalis. The treatment of cyanide rinse waters and miscellaneous rinse waters is entirely feasible by ion-exchange. However, that is beyond the scope of this paper.

In short, though, ion-exchange treatment of cyanide and miscellaneous rinse waters in ion-exchange equipment has two benefits. First, it provides a closed system with return of demineralized water to all rinsing operations. Second, it permits the reduction of the usually large volume of rinse waters that must be treated in a batch type process for neutralization and de-toxification by concentrating the rinse water contaminants into a much smaller volume of solution in the effluent ion-exchange resin regenerant solutions.

The use of demineralized water for the make-up of

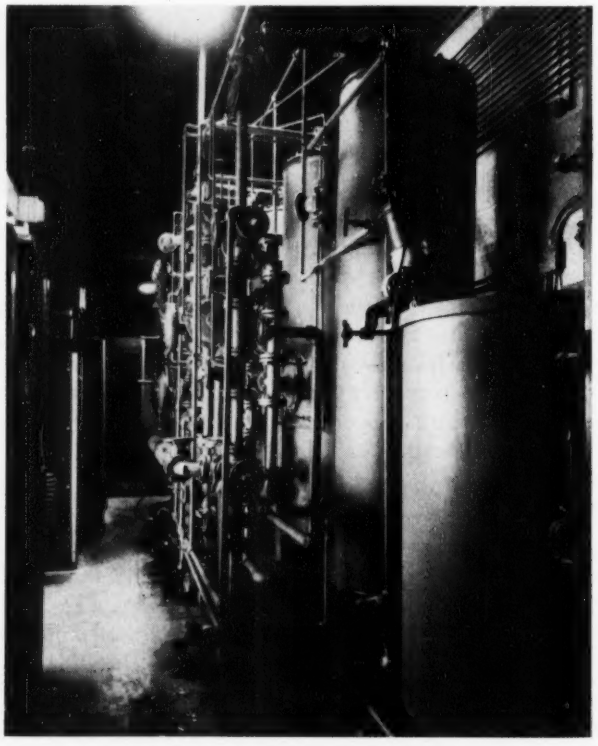


Figure 7. Automatically operated ion-exchange equipment installed in an eastern manufacturer's plating and anodizing room.

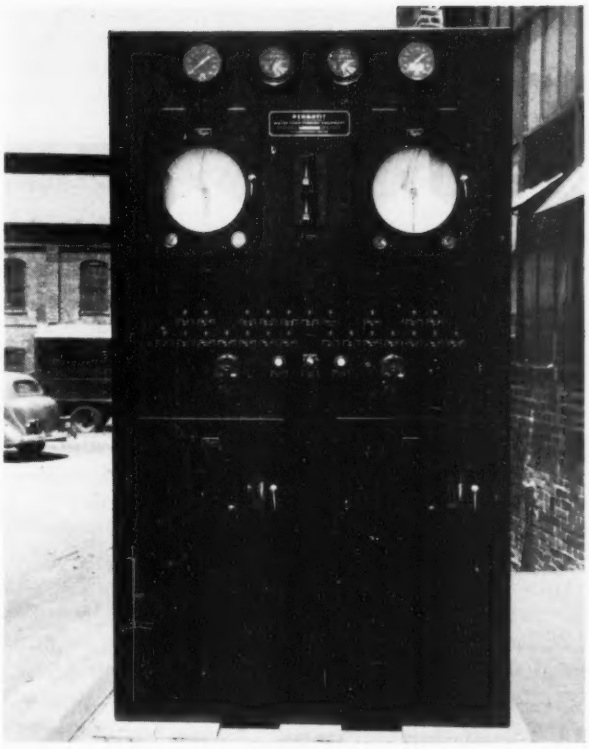


Figure 8. Typical control center for the automatic operation of ion-exchange equipment.

new baths and make-up to flowing rinse lines to compensate for drag-out and evaporation losses is of utmost importance in a metal finishing shop where ion-exchange equipment is to be installed to treat chromic acid rinse waters and baths in a closed system. This is because ion-exchange resins, in general, are not selective. In other words, an ion-exchange resin will not pick-up chromic acid and only chromic acid and permit all other ions to pass through. Instead, the anion exchange resins commercially employed for chromic acid recovery work are all of the "highly-basic" type and will pick-up CrO_3, SO_4, Cl, PO_4, F and other anions.

In general, in chromic acid plating and anodizing solutions, there are two prime constituents, chromic acid and sulfuric acid in a 100 to 1 ratio. Thus, these acids will be present in the same ratio but quite dilute in the rinses (the range of ppm.) after these baths. The anion exchange resins will pick-up both the CrO_3 and SO_4 radical from the rinse waters. When the anion unit is exhausted and then regenerated and the regenerant affluent of the anion unit treated in a cation unit, a dilute solution (per cent wise) of chromic acid and sulfuric acid is obtained still in the 100 to 1 ratio. This solution after concentration (if necessary) may then be added back directly to the plating or anodizing bath.

If raw water containing Cl, SO_4, HCO_3, NO_3 anions is added to the rinse system as make-up, the anion exchange unit will pick up these anions as well as the CrO_3 and SO_4 radicals dragged into the rinse water on the work being processed. Consequently, when the anion unit is regenerated, the regenerant effluent will contain not only the CrO_3 and SO_4 desired but all of the other anions as well, making the resultant regenerant unfit as make-up for a plating or anodizing bath. However, if demineralized water is used as make-up to the rinse system, the addition of interfering anions is minimized and the reformed chromic acid may readily be used as make-up to primary baths.

The following table lists some factors employed by ion-exchange equipment manufacturers in working with metal finishing baths and rinse waters. Ion exchange media have been employed for over 40 years for treatment of water supplies.[9]

Common Conversion Factors

1 Pound — 7 Kilograms = 15 ounces
1 Pound = 454 grams
1 Kilograin = 64.9 grams
1 Kilograin = 2.28 ounces
0.1 Per Cent = 1000 parts per million
1 Part per million = 1 pound per 120,000 gallons
Pounds per Gallon = (0.00835) × (Grams per Liter)
Ounces per Gallon = (0.1336) × (Grams per Liter)

Various Ions To Calcium Carbonate Equivalent

Ions	*Times to Convert to $CaCO_3$*
Cr^{+6}	1.92
CrO_3	1.00
Cr^{+3}	2.9
CrO_4	0.86
Cr_2O_7	0.93
Fe^{+2}	1.79
Fe^{+3}	2.68
Al^{+3}	5.55
Al_2O_3	2.94
Cu^{+2}	1.58
Zn^{+2}	1.53
Ni^{+2}	1.69
Cl^{+1}	1.41
SO_4	1.04
PO_4	1.58

The application of the new ion-exchange resins to metal-finishing room solutions is a relatively new procedure. Consequently, most ion-exchange manufacturers find it easier to work with the chemical language used over the past 40 years and convert the chemical equivalents of metal finishing room compounds to calcium carbonate as this is the standard by which ion-exchange resins have been rated over the years. Thus, in the table are conversion factors to convert the various ions to the calcium carbonate equivalent. The other factors listed in the table are for easy conversion to the concentration levels and expressions commonly used in water treatment work.

Conclusions

In summary, we find that employment of ion exchange equipment and resins is:

1. Profitable for primary bath treatment.
2. Economical for rinse water treatment as compared to batch-type treatment.
3. A means for obtaining a high quality rinse water and make-up water.

(*Concluded on page* 55)

Salt Spray Corrosion of Cadmium*

By Russell H. Wolff**

Abstract

THREE panels each of cadmium plated brass and steel were exposed in a 20% salt spray cabinet together with similar panels given a supplementary chromate dip. The brass panels were exposed for a total of 160 days by which time the cadmium had begun to flake loose. The steel panels were exposed for a total of 352 days.

All panels were subjected to weight change measurements and curves were drawn relating the weight change to exposure time.

Cadmium plate with supplementary chromate dip was superior to the untreated plate in all stages of the test including uniformity of surface appearance, suppression of white corrosion products and resistance to peeling of the plate. Adhesion of cadmium plate to brass, as evidenced by flaking of the plate during exposure, is about half as great as for cadmium to steel. Flaking of the plate did not occur with chromate treated cadmium over either brass or steel.

Chromated cadmium films lost weight as a continuous process. The untreated plate gained weight for an average of ten days, then steadily lost weight for the remainder of the test.

White corrosion which persisted after gentle swabbing of untreated cadmium did not develop until 40 to 45 days of exposure. This corrosion was found to occur (within the limits of experimental error) at the time the coating weights returned to the initial exposure values.

Chromated cadmium plate became dull green in appearance but did not show white corrosion during the entire test of 3000 hours.

Black corrosion spots were observed primarily on the chromate films. The spots increased in intensity and number concurrently with an abrupt coating weight decrease during the final weeks of exposure.

In spite of greater coating weight loss, the chromated plate is much superior in final appearance to the untreated plate.

Introduction

Cadmium as a protective coating is a useful and popular metal finish. It is easily plated over irregular objects, and affords a bright finish that is anodic in corrosion prevention of brass and steel. The preference of cadmium over zinc is well deserved because of its greater chemical resistance to alkalies and sea water immersion, and slower tendency to form tarnish films which interfere with moving parts or electrical conductivity. This preference has led to such increased use of cadmium that supply often cannot meet the demand.

The shortage of cadmium is, of course, best handled by seeking new sources of supply and by conserving or "stretching" the metal now available. One such manner of conserving the metal is the use of thinner deposits. Another and perhaps more effective way is by increasing the life of the plated coating by use of extra films such as supplementary chromate dips.

*The opinions or assertions contained herein are not to be construed as being official or reflecting the views of the Department of the Army.

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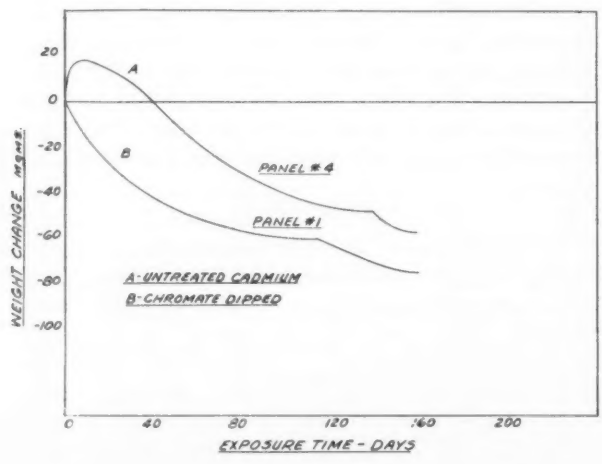


Figure 1

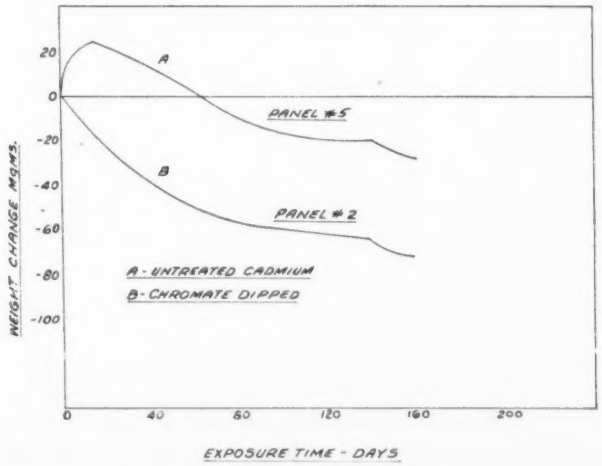


Figure 2

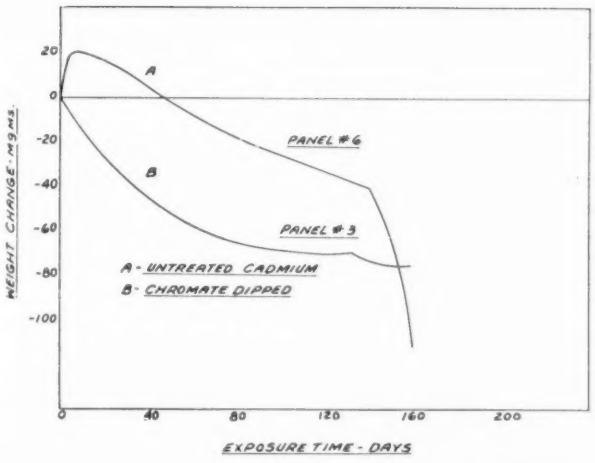


Figure 3

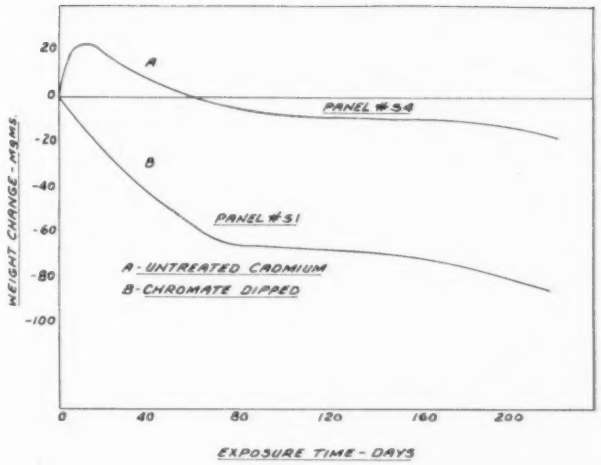


Figure 4

As a part of the inspection and advisory control work done at this laboratory, periodic salt spray exposure tests are conducted on various plated coatings from shop production plating jobs. From experience with these cadmium tests it was known that, with proper plating technique and the proper film thickness, it was rare for cadmium to fail the specification requirement, and never to fail with the supplemental dip. It was also observed occasionally during salt spray exposure that the cadmium would flake away from brass, a phenomenon which did not occur with steel.

To evaluate the salt spray corrosion resistance of cadmium over brass and steel and to determine the relative adhesion characteristics of cadmium to brass and steel, this exposure test was planned and put into effect.

By use of a standard thickness of cadmium plate (0.5 mil) on steel and brass specimens, a comparative result could be obtained by testing a supplementary dip side by side with an untreated plate prepared under identical conditions. In this manner, adhesion of the plate and the effect of the chromate film could be determined at one and the same time.

Panel Preparation

Six panels each of steel and brass 2 inches by 3 inches and $\frac{1}{8}$ inch thick were prepared under laboratory conditions. The panels were carefully polished with emery paper (150 grit followed by 280 grit), weighed on an analytical balance and plated in a cyanide cadmium bath.

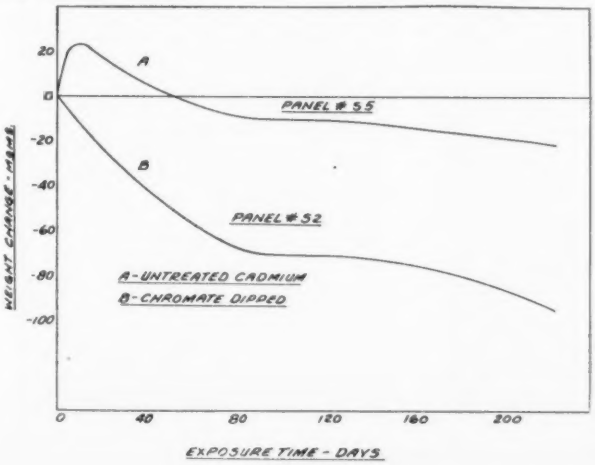


Figure 5

After plating, thickness measurements were made by chromic acid drop tests on extra panels plated with the test pieces. Penetration through the plated coat in 38 seconds at 80°F. corresponds very nearly to 0.5 mil of cadmium. All specimens were reweighed and kept in a desiccator. Three panels each of the plated steel and brass were chromate dipped to an even, iridescent yellow tin which represented about 30 seconds of immersion time at 85°F. room temperature. After thorough cold water rinsing the panels were dried by air blast. The panels were weighed again to determine the amount of material dissolved by the acidic chromate solution, and then allowed to age for 24 hours to set the film prior to test.

Test Procedure

The actual test was conducted by a repetition of the following cycle:

1. 24 hours exposure to 20% salt spray fog. (ASTM B117-49T)
2. Gentle scrubbing of the panel surface with a soft bristled paint brush under a running stream of lukewarm tap water.
3. Rinse in distilled water.
4. Rinse in alcohol.
5. Dry with gentle air blast.
6. Weigh on an analytical balance.
7. Return to salt spray.

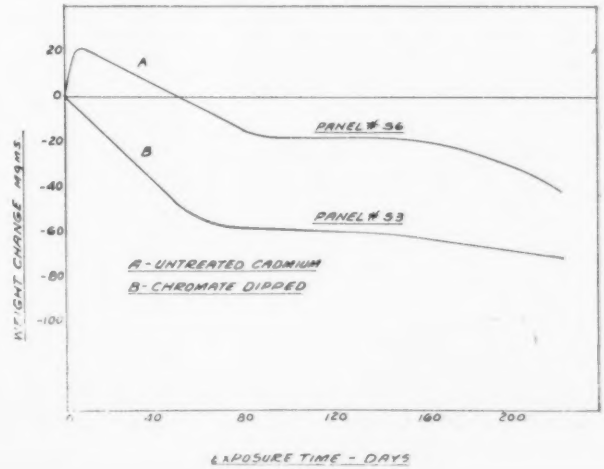


Figure 6

The panels were exposed on a glass covered 15° angle rack to minimize effects on the panel backs and lower edges from collection of fog drops into pools. Observations were made every working day, and the panels were withheld from test over week-ends until the test had been in progress for three months.

Observations of Untreated Plated Panels

As may be seen from the graphical representation of Figures 1 through 6, the untreated plated panels all increased in weight immediately upon exposure to salt spray fog, and continued to increase to a maximum at approximately 12 days exposure after which the weight decreased gradually until the test was ended. The return to initial exposure weight varied between 40 and 70 days total exposure and followed an average slope of about 26° calculated from the time the maximum increase was reached to the time of return to the zero weight change axis.

During the first 24 hours of exposure, all semblance of brightness was replaced by a light gray mottled appearance with scattered darker gray blotches. By 48 hours, the panels had a chalky gray appearance with darker blotches and a few dark pin points. This gray appearance progressed in dullness on the brass panels and became a mottled dark gray on the steel by 40 days exposure. One tiny rust dot was observed on each of the steel panels at approximately 25 days exposure. Initial white corrosion was noted at 40 to 45 days and progressed in quantity and intensity throughout the remainder of the test.

Flaking of the Deposit

During the last month of exposure of the brass panels, a brass yellow color could be detected in the pit areas and, when the cadmium plate began to flake loose, the panels were removed from test. Figure 8 represents the condition existing after 160 days of salt spray exposure.

The steel panels remained in test and continued to display a mottled gray appearance with slight changes except for a slow increase in the size of the white corrosion areas. After more than 300 days exposure,

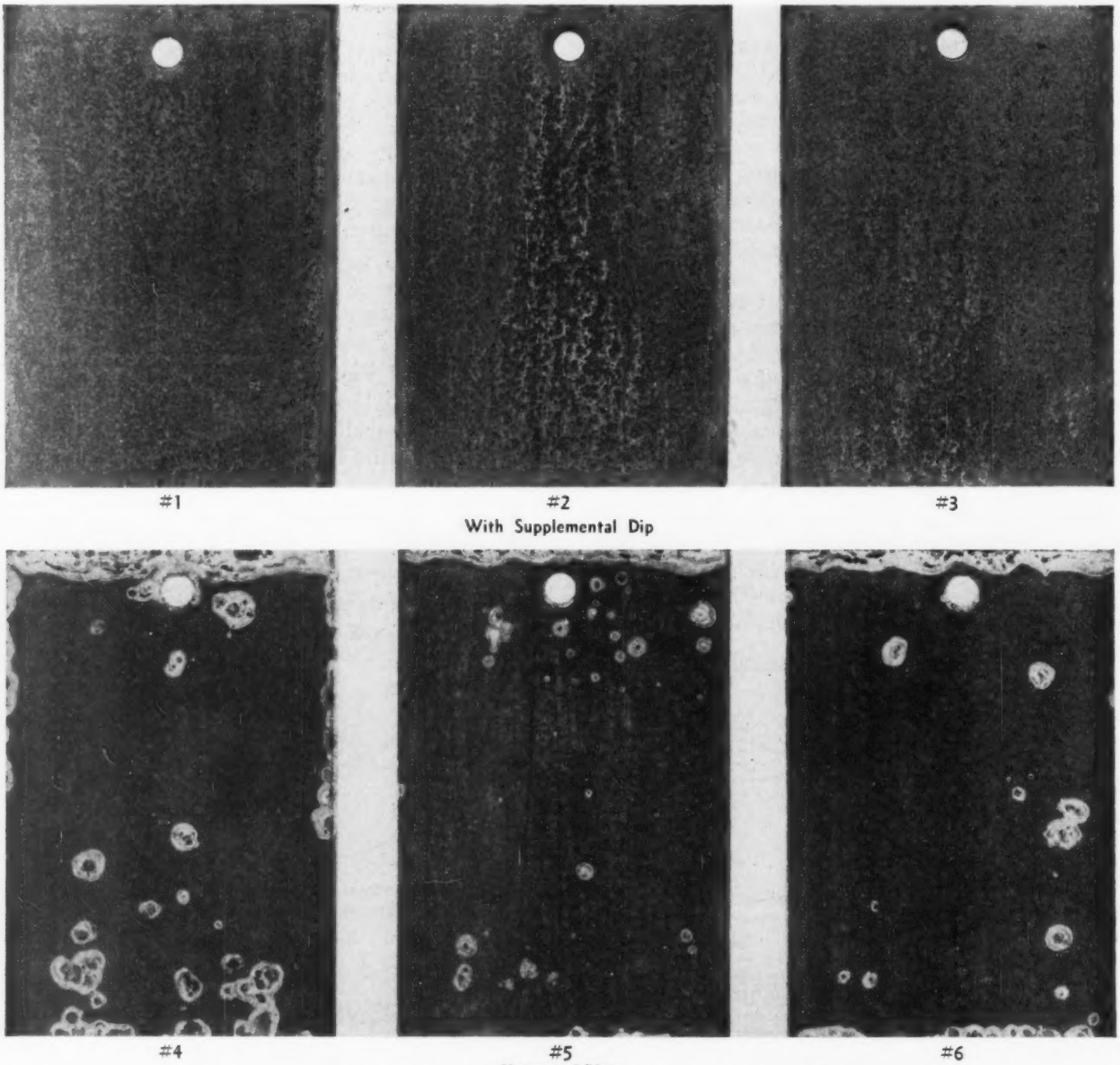


Figure 7. Cadmium plated brass panels at 125 days (3000 Hrs.) salt spray exposure.

unrusted bare steel could be seen in pits in the plate and the panels were finally removed at 352 days because of flaking of the plate. (See Fig. 11)

Observation of Chromate Dipped Panels

The treated panels decreased in weight from the moment of initial exposure to the end of the test. On the basis of a 50 mg. weight loss, the exposure time varied from 46 to 61 days, resulting in an average initial slope of approximately 46°. The golden yellow color of the chromate dip faded rapidly during the early days of the test and gave way to a faint iridescent yellow tint, which persisted with a slow and gradual dulling of the iridescent sheen through the exposure of about 50 days. During the next period of about 25 to 30 days of exposure (75 to 80 days total) the panels developed a gray-green appearance with the formation of small corrosion spots varying from light gray to black. Pitting was observed at approximately 50 days of test on all the treated panels, but the resulting corrosion spots seemed to be smaller and less intense on the steel panels than the brass.

After 125 days exposure, the gray-green color had deepened and very little of the original iridescent sheen was apparent on any of the panels. However, the panels still had a fairly acceptable appearance in smoothness and absence of the conspicuous white salt products associated with cadmium corrosion.

Appearance of Black Corrosion Spots

At the conclusion of 125 days, a series of black corrosion spots had developed on the brass panels (Fig. 7). Concurrently with the development of the spots during the final two weeks of exposure, a sharp drop was observed in the weight change curves. Hence, the brass panels were removed from test after 3,840 hours of salt spray exposure (160 days).

The steel panels at 160 days had much the same appearance in color as the brass panels, that is, an overall gray-green cast, but without the heavily defined black spots and more of the original iridescent sheen area left. Two of the panels had two or three small rust dots.

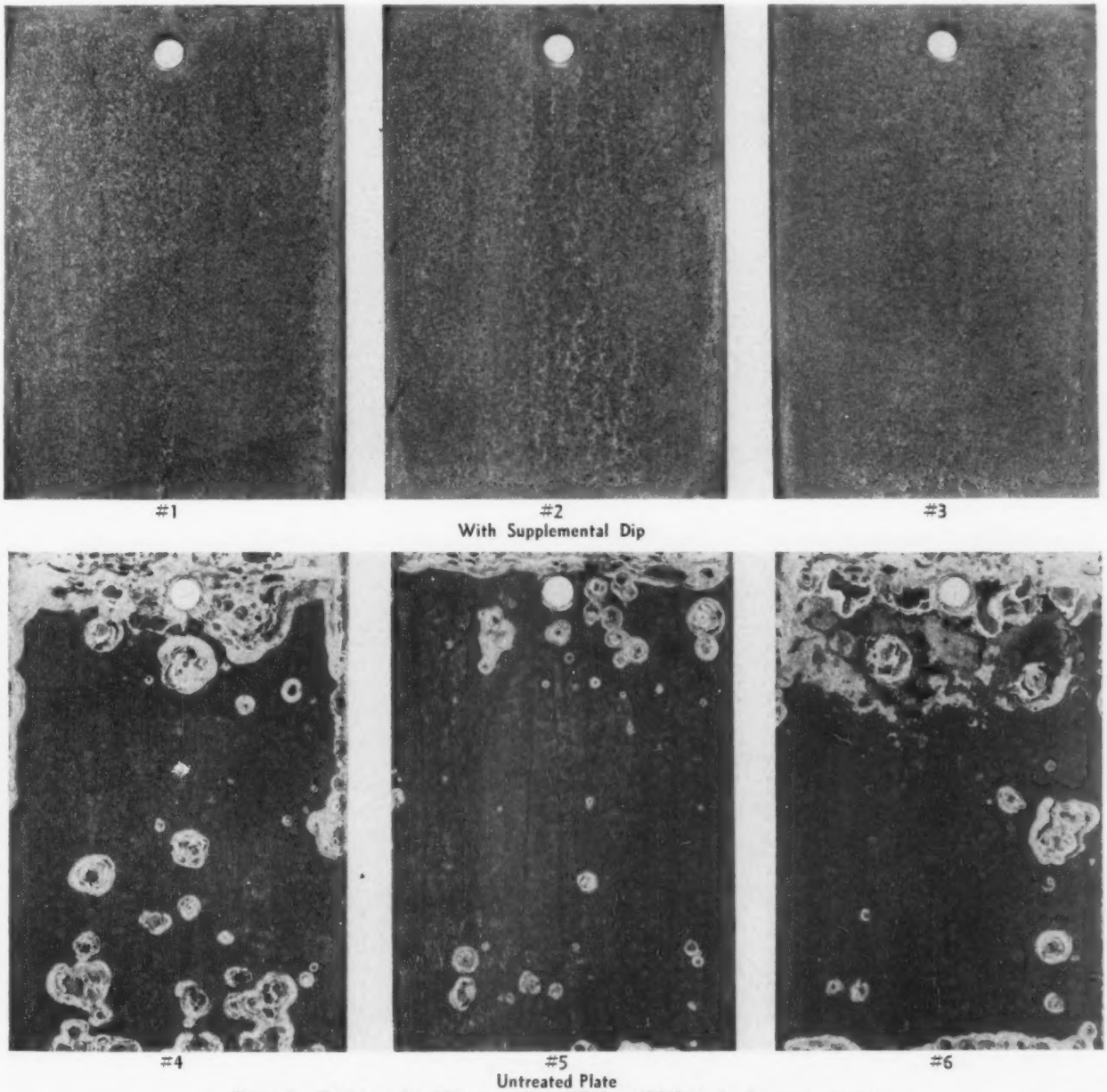


Figure 8. Cadmium plated brass panels at 160 days (3840 Hrs.) salt spray exposure.

No further changes were observed except an almost imperceptible fading from week to week until 225 days, at which time weight change observations were stopped. The panels remained in salt spray exposure until a total of 352 days had elapsed, at which time the panels were removed and the test ended. Final examination showed the same dense population of black dots as exhibited on the brass panels, together with scattered rust dots. All three panels showed the beginning of gray white corrosion failure at the upper side edges, but only one had a general overall rust staining.

Weight of Cadmium Dissolved by Supplemental Chromate Dip

The average loss of cadmium metal to the chromate solution during the time of supplementary dipping was 0.19 mg. per sq. cm. on the brass and 0.23 mg. per sq. cm. on the steel.

Discussion

The course of this experiment, it will be admitted, has led to several remarkable and rather significant deductions. First, it was not expected that the duration of the exposure would exceed at the most a month, although it was established that cadmium plated articles seldom failed the normal salt spray requirements of U. S. Army Specifications, and could be expected to do very well with supplementary chromate dips. The extension of the salt spray exposure to almost a year with white corrosion salts not apparent for over a month was most unexpected. A probable explanation for this may well be found in the fact that first indications of white corrosion are readily washed away from the surface by a stream of water, so that apparent corrosion in the first days of test may be misinterpreted in the desire to conduct an accurate salt spray test. Another subjective factor tending to support this, is the visual impact on the average observer of the

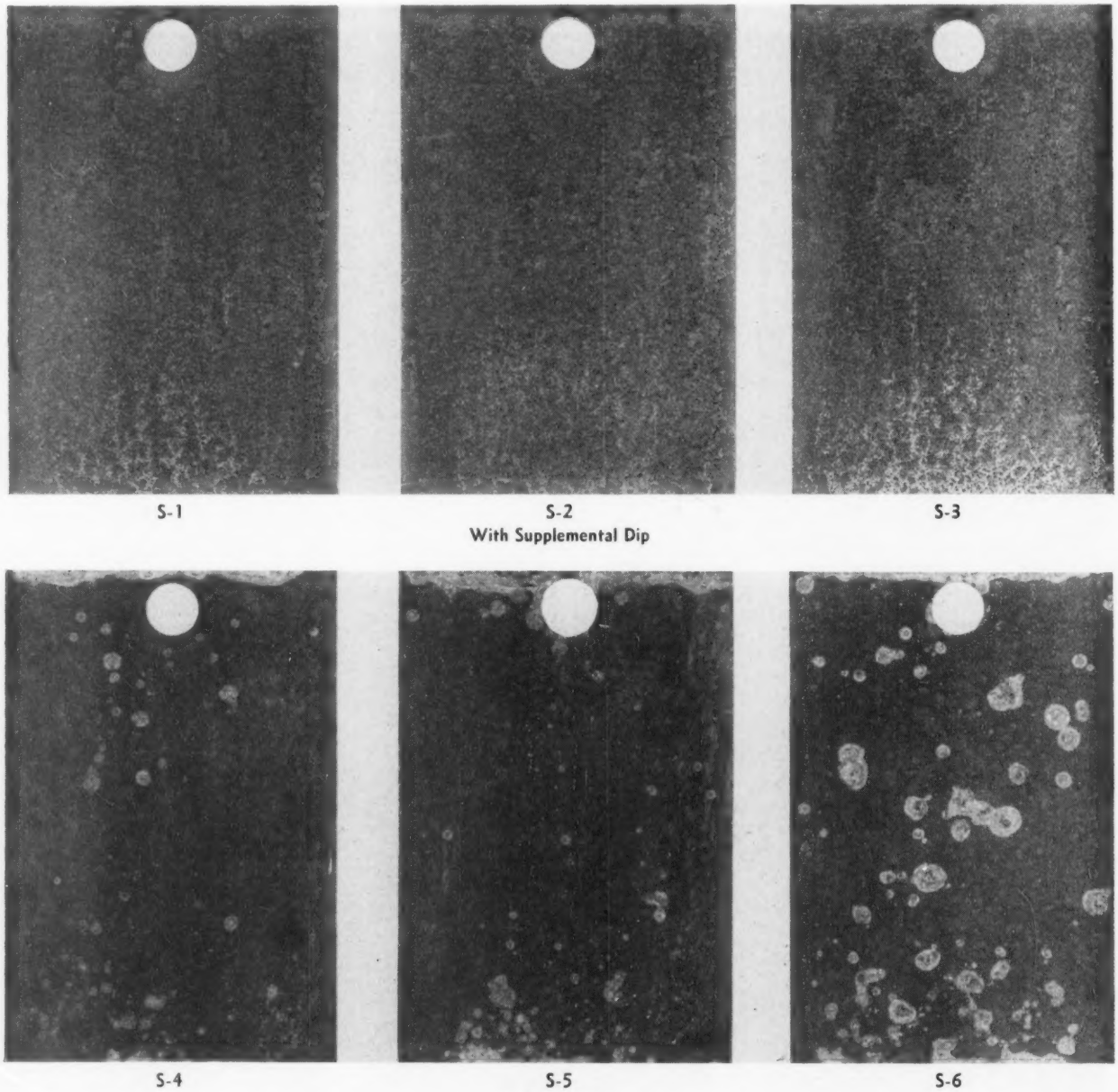


Figure 9. Cadmium plated steel panels at 125 days (3000 Hrs.) salt spray exposure.

rapid transition from a bright clear plate to a dirty mottled gray appearance almost overnight.

The actual determination of failing status in terms of corrosion products involves the problem of selecting an end point in a slowly progressing reaction. The customary criterion for failure is the appearance of the white corrosion products followed by the development of red rust. By careful examination during the test period a notation was made as nearly as possible at the initial appearance of white corrosion products which remained on the surface after scrubbing. These data are recorded in Table I where it may be noted that a striking relationship exists between the time of initial white corrosion and the time of return of the untreated panels to the initial exposure weight. What further implications this agreement may have are difficult to determine at this time since no effort was made to determine by analytical methods the exact nature of the products formed.

Another interesting phenomenon, also unexpected, was the manner in which the weight changes occurred. After the first gain and subsequent loss in weight, the untreated panels dropped into curve slopes which showed good parallelism to the curves for the chromate dipped panels. The appearances of the panels cannot be predicted from the manner in which the weight change curves move. The immediate upswing in weight

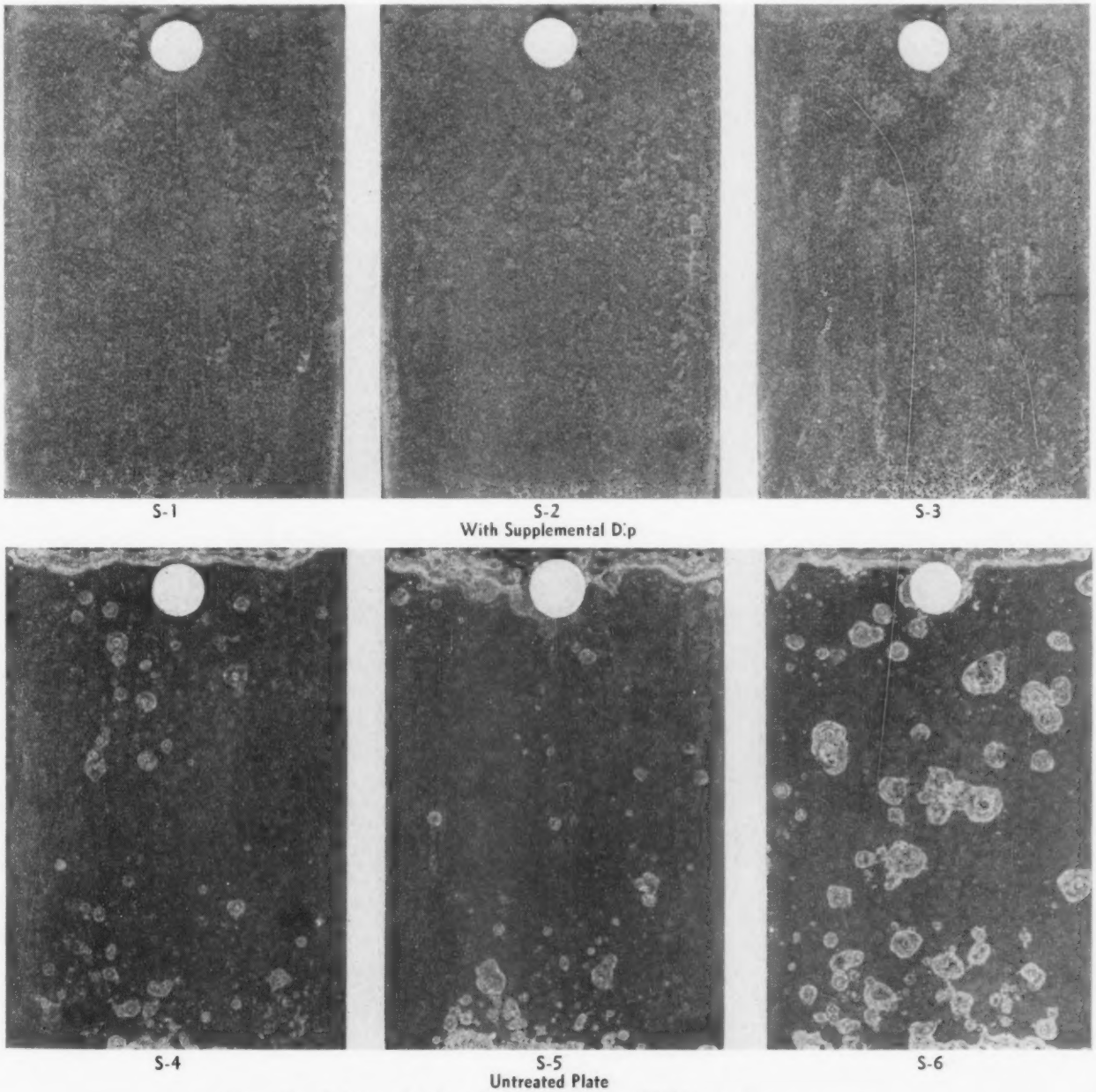
TABLE I

Exposure Data

Untreated Cadmium Plate

Panel No.	Initial Coating Weight Gms.	Maximum Weight Gain Mgm. A	Exposure Days For			Slope A (C-B)
			Max. Gain B	Return To Initial Wt. C	White Corrosion	
S-4	1.0359	23.2	12	68	67	.42
S-5	1.0588	23.2	14	60	44	.50
S-6	1.0196	20.2	5	46	44	.49
4	0.9925	18.8	8	42	40	.55
5	1.0498	24.4	14	63	67	.50
6	1.0289	19.2	7	47	44	.48

Panels with "S" prefix are steel base, others are brass.



S-1 S-2 With Supplemental Dip S-3

S-4 S-5 Untreated Plate S-6

Figure 10. Cadmium plated steel panels at 160 days (3840 Hrs.) salt spray exposure.

of the untreated plate can be most readily explained by the assumption that the cadmium undergoes oxidation to an insoluble compound and subsequent transformation to a soluble salt which is then carried away. During the initial exposure an insoluble hydroxide formation would account for the increase in weight. According to Evans,[1] the formation of the hydroxide of a heavy metal will tend to stifle corrosion due to the sparingly soluble coating thus formed. However, if any salt anions are present such as the chloride or sulfate, these soluble salts may be formed, providing the solution about the hydroxide is not sufficiently alkaline to support the hydroxide as a stable phase.

By immersion of cadmium in chloride or sulfate solutions, Borgmann and Evans[2] observed the corrosion product to be a brown insoluble compound. From this evidence they concluded that the corrosion product was oxide rather than chloride or sulfate even though the latter ions were in abundance.

In an atmosphere such as the salt spray fog immersion, effects are at a minimum. In the presence of oxygen, carbon dioxide and moisture, it is reasonable to assume that the course of corrosion tends to the formation of slightly soluble basic salts which then convert to the soluble chloride and wash away. This may well be considered in view of the fact that the alkaline cyanide residues of the plating bath are very

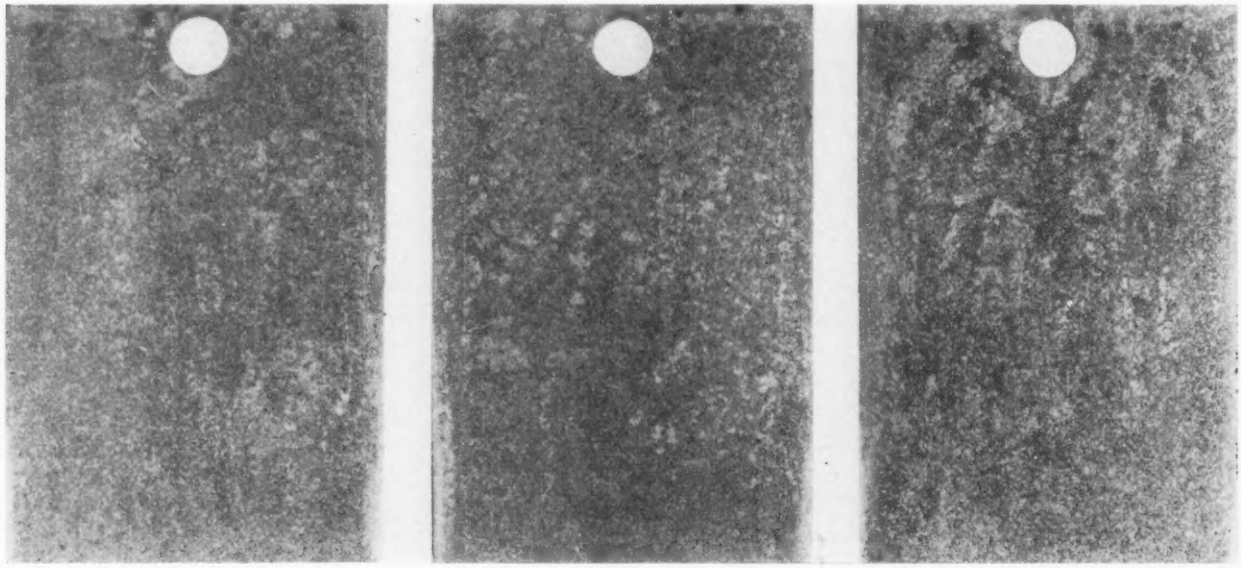
TABLE II

Exposure Data

Cadmium Plate with Chromate Film

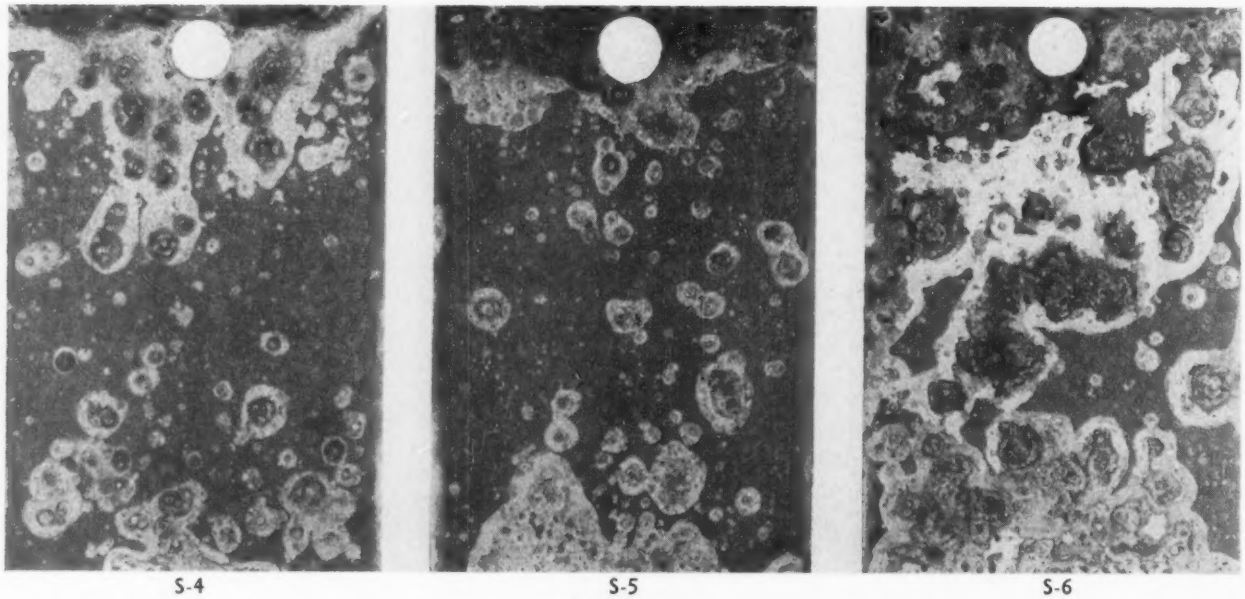
Panel No.	*Initial Coating Weight Gms.*	*Exposure Days To 50 Mgm Weight Loss*	*Slope 50 mgm. / Days*
S-1	1.0967	51	.98
S-2	1.1655	50	1.00
S-3	0.9890	57	.88
1	1.0100	61	.82
2	1.0235	60	.83
3	1.0661	46	1.09

Panels with "S" prefix are steel base, others are brass.



S-1 S-2 S-3

With Supplemental Dip



S-4 S-5 S-6

Untreated Plate

Figure 11. Cadmium plated steel panels at 352 days (8448 Hrs.) salt spray exposure.

difficult to rinse away, and any traces remaining adsorbed or unneutralized on the surface would provide the initial alkaline surroundings necessary to develop the insoluble hydroxide film. The neutral salt fog would tend to support the film for the few days until the chloride anions established the necessary conditions for the breakdown and dissolution of the hydroxide film and from thence the continuous formation of soluble salts.

The later development of adherent white corrosion products would then be the localized results of corrosion cells. Such cells, established about inclusions or other focal points in the plate would, as a final result, produce a pit to the base metal.

In the case of the supplementary dip, there is practically no possibility of alkaline residues on the surface due to the acidic nature of the dip solution. As a further extension of the acidic chromate dip solution, it has been shown by Doss and Henderson[3] that the sulfate anion present in the chromate solution is incorporated into the coating, and leaches away rapidly with immersion in running water. This fact may be used in the explanation for the immediate decrease in weight of the chromate dipped panels. The presence of the sulfate ion creates a situation which prohibits the formation of any basic salts. There is no weight gain of slightly soluble products, but only an immediate conversion to soluble salts which are carried away.

The retention of the gray green color to the very end of the test agrees with the findings of Anderson[4] that the residual film fades from yellow to green with the loss of the hexavalent chromium. The findings of Doss and Henderson indicate that approximately 90% of the chromium, remains in the film even after extended exposure periods.

The adhesion characteristics of cadmium to brass and steel were demonstrated in an interesting manner as may be seen by the photographic representations in Figures 7 through 11. The chromated cadmium plate showed no evidence of failing adhesion on either brass or steel. The untreated plate on brass panels showed brass colored pits. At the conclusion of 160 days, large flakes of cadmium came loose from one panel and uncorroded brass areas were readily observed on the remaining two panels. The steel panels showed flaking of the plate at more than twice the exposure time of the brass. One reason for the better adhesion with the chromated plate is probably in accordance with Anderson's[4] proposal that the insoluble trivalent chromium film mechanically excludes water from the protected surface.

It is believed that several unusual and significant facts arose during this exposure test. There is yet no satisfactory explanation for the black corrosion spots, either in their presence or contribution to failure of the films. The data gathered from the test have been useful and abundant. It is hoped that further use may be made of the results of the investigation.

The author wishes to express his appreciation to his co-workers at the Rock Island Arsenal Laboratory for their assistance and to the Ordnance Corps, Research and Development Division of the Department of the Army and the supervisory staff of the Laboratory for permission to publish the information in this paper.

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DO'S AND DONT'S IN PLATING OPERATIONS

(*Concluded from page* 47)

4. Space saving as compared to batch treatment.
5. Time saving as compared to batch treatment.
6. A closed system.

In order to profitably use ion-exchange equipment and resins the metal finishing facility should provide:

1. Save rinse tanks.
2. Counter-current rinse systems.
3. Segregation of drainage systems into
   a. Chromic acid rinse system.
   b. Cyanide rinse system.
   c. Miscellaneous rinse system.

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Phosphate Coating Retention During Cold Extrusion of Artillery Shells*

By Lloyd O. Gilbert, Stanley L. Eisler, Jodie Doss and W. Dennis McHenry**

Abstract

STEEL slugs which had been through the first step of the 105 mm shell extrusion process were prepared for the second step by precleaning, phosphating in a radioactive phosphating bath and applying a lubricating soap film. Counting rates before and after extrusion were determined and the percentage of retained phosphate coating was calculated. It was found that very little of the coating is removed during the extrusion process as approximately 89% remained after extrusion.

Introduction

Drawing, the art of making a metal rod into wire by pulling it through a series of dies of diminishing size, and extrusion[1] the art of changing the shape of metal by exerting tremendous pressures on it in a die, tend to wear the dies to a great extent if some form of lubrication is not applied to the metal being worked.

*The opinions or assertions contained herein are not to be construed as being official or reflecting the views of the Department of the Army.

**Ordnance Corps, Rock Island Arsenal, Rock Island, Ill.

Figure 1. Steel slug after second cold extrusion.

As early as 1880 the use of phosphate coatings as a lubricant for these processes was known.[2] These coatings do not lubricate in the usual sense of the word, but they do prevent a metal to metal contact, since the coating is a series of closely packed and strongly adhering crystals. According to Schmidt,[3] these crystals undergo permanent deformation during the process. Soaps and greases have been used as lubricants in this type of work, but the film breaks easily under conditions of great speed or high pressures. Once this film is broken, the material being worked must be cleaned, pickled and relubricated before the next step may be undertaken. Phosphate coatings do not break or tear as easily as the soap or grease films and they greatly enhance modern, high-speed production, since the work may be passed through a series of dies without the need of relubrication.

Current practice is to use a combination of both types of lubricating materials. The piece to be worked is first phosphated and is then given a subsequent coating of soap or grease. The phosphate coating tends to absorb larger amounts of the organic lubricants than the base metal and due to its own lubricating qualities is an excellent material to use for this process.

Recently the question arose as to how much of this phosphate coating remains on the piece after it has been worked. Singer[4] states that a "substantial" amount is removed when the piece is worked. Durer[5] and Overath[6] state that about 20-50% and 25% to 50% respectively, is rubbed or stripped off by the tool or die. On the other hand, Faber and Kopp[7] mentioned that, after drawing, there is often enough of the coating remaining to be an acceptable base for subsequent lacquer applications.

The amount of phosphate coating retained after extrusion or drawing operations may be found by determining the coating weight of two identically treated pieces, one prior to processing and the other after processing. This procedure may lead to difficulties since the size of the work pieces may be so large as to make the small amount of coating applied insignificant in weight determinations.

Since radiometric techniques afford a great sensitivity and since it is possible to work with a piece both before and after extrusion, it seemed advisable to use a coating containing radiophosphorous as a means to determine the amount of retention or loss of phosphate coatings during drawing or extrusion processes.

Procedure and Results

Ten steel slugs which had been through the first step of the 105 mm shell extrusion process were procured from the Rockford Ordnance Plant operated by Pressed Steel Car Co., Rockford, Ill.

The slugs were electrolytically cleaned and derusted in an alkaline bath,[8] water rinsed and air blown until dry. The slugs were then pickled for 15 minutes in a 10% sulfuric acid solution, which was maintained at a temperature of approximately 150°F., thrice water rinsed, and dried.

After the preceding cleaning process, the steel slugs were phosphated for 15 minutes in a five gallon volume of a 35 point,* chlorate accelerated, zinc phosphating bath, water rinsed and dried. The phosphating bath was maintained at a temperature of 160°F. Radiophosphorus in the form of $H_3P^{32}O_4$ was added to the above bath to give an activity level of approximately 0.1 microcurie per milliliter.

The radiophosphorus used for this investigation was procured from the Oak Ridge National Laboratory by authorization of the Atomic Energy Commission, Isotopes Division.

To facilitate the extrusion process, the phosphated slugs were submerged in a 140°F. soap solution for 5 minutes, dried and allowed to cool. The soap solution prepared for the above process contained a high titre soap and had a 5-6% fatty acid content. It is believed that the fatty acid of the solution reacts with the zinc phosphate coating forming a zinc soap on the surface of the phosphated object which acts as a lubricant during the extrusion process.

At the beginning of this investigation, a vertical line parallel to the axis was scribed on five of the slugs. This line was then marked off at ¼" intervals by a series of punch marks. One of the marked slugs after extrusion is shown in Figure 1. These markings were placed on the slugs in order that the elongation of the surface at various points might be calculated.

After the slugs cooled, the counting rates were determined for ½" bands (numbered 1 to 4) starting at the bottom of the cylindrical portion of the slug with ½" intervals between each band counted. In order to obtain a representative count around the entire circumference at each band level, the slugs were mounted on a turntable as shown in Figure 2. The lead shield shown at right angles to the slug has a ½"x½" square hole in the center directly in front of the counter tube. The purpose of the lead shield was to stop all radiation from reaching the tube except that which passed through the ½" opening. The time of counting was adjusted so that exactly two revolutions were made by the slug, eliminating the possibility of counting areas of higher or lower activity more often than other areas. The technique of using the turntable was developed after it had been found that there was a large variation in counting rates taken at different points around the circumference of the slug.

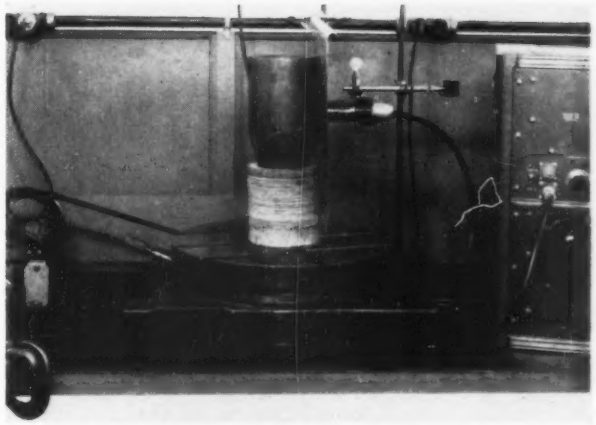

Figure 2. Setup for determining counting rates.

The slugs were then sent to the Rockford Ordnance Plant for the second extrusion step in the process and returned to this Arsenal. The extruded slugs were then recounted as outlined. However, due to the elongation from 3¾" to 5¼" of the cylindrical portion of the slug, six bands were counted as compared to four bands on the original slugs.

The results of the counting rate determinations are presented as counts per minute in Table 1. The counting rates after the second extrusion are given for band

*A point is equal to 1 ml. of N/10 NaOH when titrating a 10 ml. sample.

TABLE 1

Counting Data

Slug No.	Counts/Minute							
	Position No. 1 Before-After Extrusion		Position No. 2 Before-After Extrusion		Position No. 3 Before-After Extrusion		Position No. 4 Before-After Extrusion	
1	2281	1611	2671	1348	1206	1321	2300	1706
2	2748	1231	2394	1252	2274	1198	2322	1717
3	3035	1923	2887	1625	2704	1658	2876	2319
4	2152	1414	2132	1083	1941	1110	1759	1256
5	2347	1237	2383	994	2519	1246	2778	2013
7	1627	1481	1840	978	1999	1048	2106	1212
8	1762	1209	1690	897	1461	809	1504	989
9	1552	1134	1737	923	1876	900	1877	1190
10	1847	1514	1819	1016	2068	987	2167	1449
Average	2150	1417	2172	1124	2127	1142	2188	1539

Data for slug No. 6 was omitted due to the different pretreatment employed.

TABLE 2

Elongation Data

No. of ¼" Interval from bottom of cylindrical portion of slug	Slug No. 4	Slug No. 5	Slug No. 6	Slug No. 7	Slug No. 8	Avg.	Ratio Avg. .250
1	.280	.295	.287	.284	.294	.288	1.152
2	.298	.311	.295	.298	.304	.301	1.204
3	.324	.336	.324	.321	.332	.327	1.308
4	.356	.368	.350	.349	.350	.355	1.420
5	.388	.414	.399	.397	.418	.403	1.612
6	.414	.419	.431	.413	.426	.421	1.684
7	.428	.414	.421	.408	.412	.417	1.668
8	.392	.400	.403	.407	.414	.403	1.612
9	.404	.391	.382	.389	.404	.394	1.576
10	.383	.372	.387	.367	.372	.376	1.504
11	.349	.344	.350	.340	.338	.344	1.376
12	.316	.316	.320	.323	.311	.317	1.268
13	.307	.307	.299	.298	.294	.301	1.204
14	.290	.273	.284	.274	.269	.278	1.112
15	.263	.254	.264	.260	.262	.261	1.044
						overall avg.	1.383

TABLE 3

Summary of Results

Position No.	1 Average c/m Before Extrusion	2 Average c/m After Extrusion	3 Elongation Factor	4 Col. 2x Col. 3 (c/m)	5 Col. 4x Decay Correction (1.088) (c/m)	% Retained $\frac{\text{Col. 5}}{\text{Col. 1}} \times 100$
1	2150	1417	1.178	1669	1816	84.5
2	2172	1124	1.648	1852	2015	92.8
3	2127	1142	1.540	1759	1914	90.0
4	2188	1539	1.158	1782	1939	88.6
					Average	89.0

No. 1, the average of bands No. 2 and No. 3, the average of bands No. 4 and No. 5, and band No. 6. This method of grouping results was based on the elongation data shown in Table 2, wherein it may be noted that the ratio of the elongation is very low at the points of bands one and six which correspond to intervals 1 and 2 and intervals 13 and 14 respectively. It is to be noted that the values presented in Table 2 are the actual distances between the punch marks on the vertical line measured after extrusion, which were 0.250 inch apart before extrusion.

The summary of the results obtained is presented in Table 3. The figures in columns 1 and 2 are taken directly from the counting data presented in Table 1. The elongation factor is an average of the ratios given in Table 2 which most nearly represent the width of the counting band, i.e., intervals 1 and 2 for band 1; 5 and 6 for band 2; 9 and 10 for band 3; and 13 and 14 for band 4. Column 4 presents the average counting rates for the various bands corrected for the elongation during extrusion. Since there was an average elapsed time between the two counting periods, i.e., before and after extrusion, of approximately 42 hours, it was necessary to correct for the loss in activity of the radio-phosphorus due to its natural decay. This was done by multiplying all counting rates taken on the later date, by the factor 1.088. The final corrected values are shown in column 5 and the percent of phosphate coating retained for each band is presented in column 6. The average of all the percentage retained values is given as 89.0% indicating that only 11% of the phosphate coating is lost during one step of the extrusion process.

Summary

The most interesting fact obtained from this investigation was that the extruded cylindrical portion of the slugs still retained an average of 89% of the phosphate coating after a 38% elongation. This is a substantial amount considering the amount of pressure and temperature the slugs are subjected to during the extrusion process.

The average counting rates after extrusion presented in Table 3, Column 2, reveal that more phosphate coating is retained on the slug in positions 1 and 4 than in

(*Concluded on page* 61)

Tin Fluoborate Plating

By J. B. Mohler, *Consultant, New Castle, Pa.*

TIN is plated either from alkaline baths or acid baths, the alkaline baths consisting primarily of sodium or potassium stannate. The sodium bath is widely used because of exceptionally good throwing power and relatively simple bath control.[1] The potassium bath is used because of greater bath stability and higher plating rates[2] than with the sodium bath. However the cost of the potassium salts is higher than the corresponding sodium salts.

The commercial acid tin baths consist of the "halogen" bath, the sulfate bath and the fluoborate bath.

The halogen tin bath[3] is used for thin deposits at high plating rates, such as in the high speed electrotinning lines for production of tin can stock. For heavier deposits, the sulfate or fluoborate baths are used. The stannous sulfate bath[4] has been successfully used in many applications for quite a few years. Brighter deposits can be obtained than with the alkaline baths, the anode and cathode efficiencies are essentially 100% and the bath is operated at room temperature so that there is little trouble when stop-off materials are used.

The stannous fluoborate bath that has come into use more recently[5] is more stable than the sulfate bath and heavy deposits can be obtained at higher current densities.

Much of the literature on acid tin plating is concerned with addition agents, indicating that these are vital for satisfactory plating from the acid baths. In the absence of addition agents, a deposit from an acid tin bath is worthless. This means that good addition agent control is essential for continuous operation, since any appreciable loss in the addition agent effect will result in an unsatisfactory deposit. Such control must not only be good but it must be possible to control the bath over a long period of time in order for the bath to be economic.

Addition Agents

In general, the addition agents that are effective for the sulfate bath are also effective for the fluoborate bath. This gives one a wide choice since many formulas have been published. On the other hand, it indicates that there has been much effort expended to find a more satisfactory formula. A single addition agent that would be effective and easily controlled would certainly be desirable. Since none such exists it is necessary to make a choice from known combinations of addition agents. Parkinson[6] reports good results with beta-naphthol and gelatin in a tin fluoborate bath. Mathers[7] lists the same addition agents along with cresol-sulfonic acid for a tin sulfate bath.

Cresol-sulfonic acid, beta-naphthol and gelatin were used over a period of several years for precision plating of sleeve bearings with 0.5 to 2.0 mils of tin.

Of these three addition agents gelatin is the most effective. Even though it may be considered as the primary addition agent, it is more effective in the presence of the two secondary addition agents than alone. Since the gelatin is subject to decomposition into inert amino acids, it cannot be controlled by chemical analysis. Also, since it decomposes, it cannot be controlled on a drag-out basis. The alternative methods, therefore, are either to establish control by determining a schedule for frequency of additions or to control by plating range test.

There has been considerable discussion over the use of gelatin or glue as an addition agent. Apparently there is a considerable difference in the effectiveness of one grade of glue or gelatin as compared to another. Some platers feel that a low grade glue is more effective than a high grade glue. Others feel that gelatin is more reliable in that it is essentially a refined glue and, as such, will be more consistent in quality. There is fairly general agreement that gelatin or glue should be an animal product and not a vegetable product.

Beta-naphthol and glue have been recommended[8] for a tin fluoborate bath. The beta-naphthol will increase the limiting current density in the presence of gelatin. The bath is essentially kept saturated with this chemical at one gram per liter so that there is little difficulty with control.

Cresol-sulfonic acid will increase the limiting current density and decrease the tendency to tree in the high current density areas. Also the cresol-sulfonic acid acts as an anti-oxidant for the tin.

Control of cresol-sulfonic acid is not critical and it may be used in relatively small or relatively large amounts.

The Plating Bath

The following formula has been used successfully:

Stannous tin	30-40 g./l.
Free boric acid	20-30 "
Cresol-sulfonic acid	20-30 "
Gelatin	1 "
Beta-naphthol	1 "
pH	0.2-0.6

The bath is not critical with respect to tin content and the concentration may be increased to 60 grams per liter of stannous tin to increase the limiting current density. It is merely a matter of whether the increase in limiting current density will pay for the cost of higher tin concentration in terms of increased plating rates.

The tin oxidizes to the stannic form which is then ineffective. Consequently, the bath is controlled in terms of stannous ion by a direct iodine titration. Stannic ion builds up in a fresh bath but, since the stannous ion is formed at the anodes, an equilibrium will be established in one to two months of operation.

The common titration for boric acid is not satisfactory, but the boric acid can be controlled by measuring the amount of boric acid necessary to saturate the bath.[9]

The acidity can be controlled by the use of pH papers. An acidity of 30 to 40 grams per liter of free fluoboric acid will result in a pH of about 0.2 to 0.6. The bath is not critical as to acid content, so that more acid may be used, and control is feasible by titrating a concentrated sample with sodium hydroxide, to the first appearance of a precipitate.

The cresol-sulfonic acid may be controlled by the use of a bromination method to definite limits and much higher concentration may be used.

THIN DEPOSITS:

The formula given was used for flash plating 0.02 to 0.05 mils of tin for shelf life protection of cold rolled steel. At a current density of 20 amperes per square foot consistently good deposits were obtained with very little control trouble. Gelatin to the extent of 0.2 grams per liter was added once a week, beta-naphthol was added every 3 to 4 weeks and cresol-sulfonic acid was added every 4 weeks. Plating tests were run about every two weeks to determine the optimum amount of addition agent to add.

HEAVY DEPOSITS:

For plating of 0.5 to 2.0 mils of tin it was found that close control and frequent plating tests were necessary. The stannous ion, the boric acid and the pH were held to definite limits. The amount and kind of addition agent required was then determined by plating test.

The bath was 12 cubic feet and about 50 square feet per day were plated at a current density of 15 amperes per square foot. Tin, boric acid and pH were controlled by chemical analyses and the addition agents were controlled by plating test. Plating test control was by means of the four inch slot cell.[10] Figure No. 1 shows the appearance of a typical panel section. Figure No. 2 shows the variation of the slot test with time where the two lines on the chart define the limiting current density for the grey and rough areas on the test panel.

ADDITION AGENT CONTROL:

Initially, the bath was controlled by addition of all three addition agents every 15 to 30 days. It was found that it was necessary to plate at a current density of 15 amperes per square foot to obtain a semi-bright deposit. There was occasional trouble with slight roughness of the deposit, but it was not serious.

After the bath had been used for six months it was found that more consistent results were obtained by the addition of gelatin twice a week and of the other addition agents when required, as determined by the slot test.

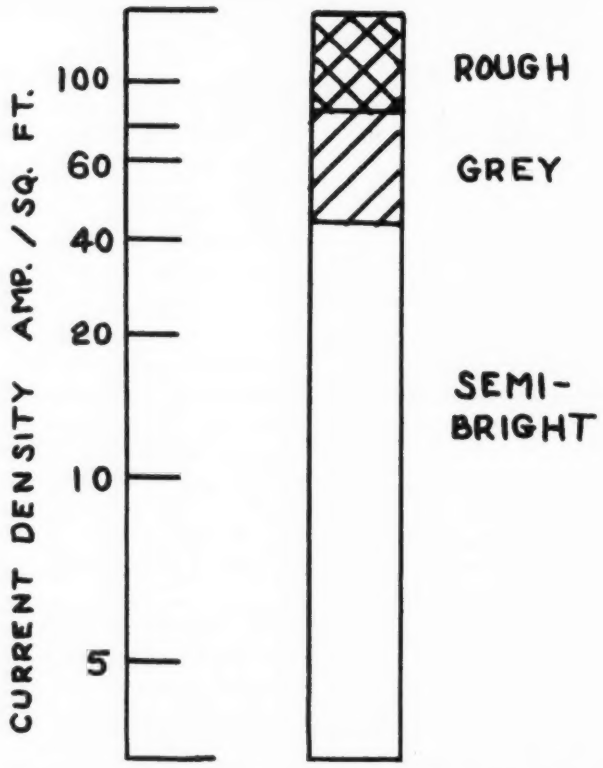

Figure 1. Appearance of a typical panel section plated at an average current density of 20 amp./sq. ft.

Alloy Baths

Copper or antimony can be added to acid tin baths to produce alloy deposits with better wear resistance than pure tin. These metals act as noble metals in the bath, so that the amount of metal co-deposited with the tin will be governed by the diffusion rate across the cathode film. The amount of metal in the deposit will

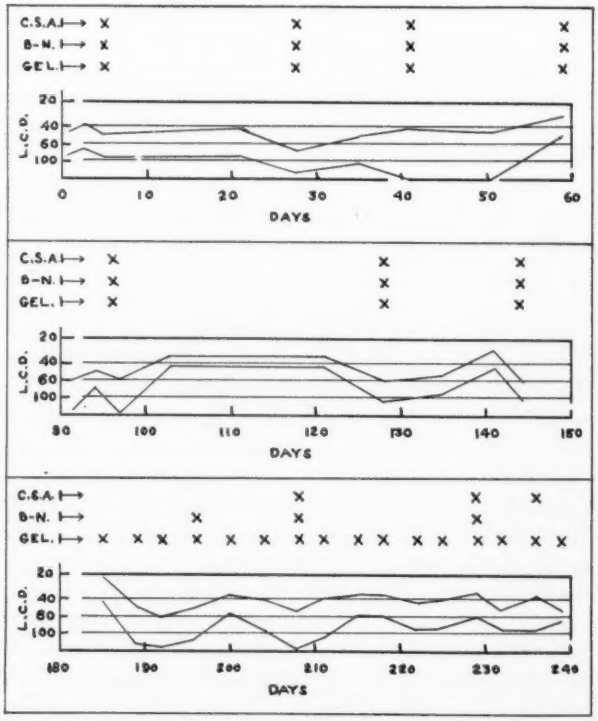

Figure 2. Variation in limiting current density with time.

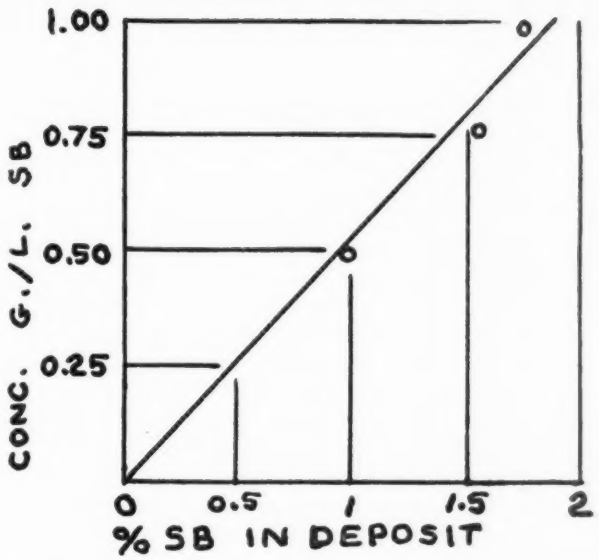

Figure 3. Effect of antimony concentration on the composition of the deposit.

be directly proportional to the concentration in the bath. This is shown in Figure No. 3 for a tin-antimony bath at a current density of 20 amperes per square foot.

The amount of metal in the deposit will decrease with increasing current density and will increase with increasing agitation. Also the metal will immersion plate on the anode at almost the same rate that it deposits at the cathode.

For small amounts of these metals in the deposit, preparation of steel prior to plating is the same as for normal acid tin plating. In the range of 1 to 3% in the deposit a copper strike is required to avoid loss of bond. Above 3% bonding becomes difficult and above 6% it becomes very erratic, even with a copper strike.

Antimony can be added to the bath by anodic solution from an antimony anode or as antimony fluoride. Copper can be added to the bath by anodic solution from a copper anode or as copper carbonate.

The characteristics of these alloy baths are very similar to the basic tin bath so that control is essentially the same.

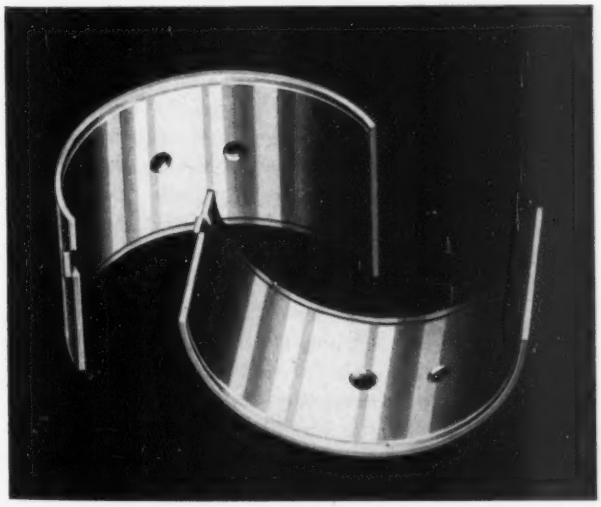

Figure 4. Connecting rod sleeve bearings of the type plated with a tin overlay.

Conclusions

The tin fluoborate bath can be controlled for long periods of time by the use of a plating range test.

The bath is not critical for tin concentration, acidity, boric acid or cresol-sulfonic acid. The bath may be kept saturated with beta-naphthol, but the gelatin must be controlled.

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PHOSPHATE COATING RETENTION

(*Concluded from page* 58)

positions 2 and 3, which are the areas of greatest elongation. This indicates that the phosphate coating is elongated to a similar degree as the base metal and may possess plastic properties.[5]

The radiometric technique employed for this investigation has certain advantages over gravimetric methods in the determination of phosphate retention. Gravimetric methods must rely on the similarity of two samples, i.e., a determination on one sample before extrusion and a similar determination on a different sample after extrusion. Gravimetric methods are inherently gross, since the work pieces are heavy and the light weight of the phosphate coating tends to become insignificant in comparison. The gravimetric method yields only data which is based on averages for the whole area in question.

The radiometric technique, however, has none of these drawbacks. Determinations may be made on the same sample before and after extrusion and may be made as sensitive as desired by regulating the tracer content of the bath. The data obtained also provides information as to the relative retention on different areas of the large work piece.

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Science for Electroplaters

2. Elements

By L. Serota

CHEMICAL changes occur between particles of matter. When these particle cannot be broken down (decomposed) or changed (reduced) into simpler substances by chemical means the substance is considered to be an element. Changes involving radioactive elements will be discussed later. Iron is an example of an element because the metal is not changed into simpler substances during the process The surface is cleaned but the metal remains as the element iron. When the element nickel is annealed (heat treatment), it is not changed into simpler substances. When nickel is used as an anode, the metal is reduced in size but what is left remains as nickel. Other common examples of elements are oxygen, hydrogen, carbon, gold, copper, chromium, and zinc.

The universe is composed of 92 simple natural substances or elements. (The ancients believed that four "elements" — fire, air, water, and earth — made up all substances). Only nine of these elements were known before the beginning of the Christian era. The metals included copper, gold, mercury, iron, silver, tin, and lead. The nonmetals consisted of sulfur and carbon. All of the metals, with the exception of lead and tin, are found in native (free) form. Because lead and tin were easily separated from their ores, these metals also became available then. Until 1750 only four additional elements, arsenic, antimony, phosphorus and cobalt, were discovered. In the period since then, considered the beginning of modern chemistry, the remaining elements have been discovered. Now science has achieved the impressive feat of producing additional (artificial) elements by means of nuclear reactions. The first of such "transuranium" elements, number 93, was discovered in 1940. It was named Neptunium. Since then the following elements have been added: Plutonium No. 94 (1940); Americium, No. 95 (1944); Curium, No. 96 (1944); Berkelium, No. 97 ((1949); Californium, No. 98 (1950).

In the field of electroplating, practical applications have been found for about fifteen electrodeposited metals (elements). These include cadmium, chromium, cobalt, copper, gold, indium, iron, lead, nickel, platinum, palladium, rhodium, silver, tin and zinc.

Symbols

Elements are represented by symbols, a system proposed by Berzelius in 1813. The symbol is usually the first letter of the Latin name. When two or more elements have the same initial letter, as carbon, cobalt, chromium, and chloride, the second or third letter of the element will be included in the symbol as a means of distinguishing between them. In the table of elements carbon is represented by C, cobalt by Co, chromium as Cr, and chlorine by Cl. The names of elements are derived from various sources. Copper, gold, sulfur, and tin retain their ancient names. Many names have a Greek derivation, such as chlorine for greenish-yellow and chromium for color. Some are named after cities or states where research efforts led to the discovery of the element. Californium is named for the State of California. The ending-ium is used for newly discovered metals.

The symbol used in chemical formulations does not merely stand for the abbreviation of the word. It represents a definite quantity of an element. This was best explained by an English schoolmaster John Dalton who, in 1801, proposed what is generally known as the atomic theory. This theory has been adopted to explain the principal facts of chemical combination. It is considered the most useful theory in modern chemistry. Dalton assumed in his proposals that (1) matter is made up of small particles called atoms; (2) atoms of the same element are alike in size and weight; (3) atoms of different elements can unite to form compounds. Developments in the study of atomic structures have served to modify Dalton's theory rather than to discard the basic principles he proposed. Since atoms possess weight, it should be possible to set up a scale of weights for comparison. The weight of the individual particle (atom), though known with great accuracy, is too small to use conveniently in ordinary calculations. It is possible, however, to compare the weights of elements (relative weights) by selecting one as the standard. The present standard is oxygen, which is taken at 16.00, and the atomic weight of any other atom is referred to this standard. When a symbol is written, it represents one atom of an element and the weight of one atom. The table, on the following page, lists the approximate weights of a number of the common elements.

Compounds

Since atoms of different elements can unite chemically to form a substance with new properties, a change of this type, when it occurs, results in the formation of a compound. Iron exposed to air (moist) will form a film called iron oxide (rust). This is the result of the iron uniting with the oxygen of the air. Since the rust possesses properties entirely different from the two original substances, iron and oxygen, the change represents the formation of a compound. Chromium remains bright in the atmosphere because a visible protective oxide film (a compound) forms. Conversely, it should be possible to decompose compounds into simpler substances by chemical means. As an example, the evolution of hydrogen at the cathode and oxygen at the anode in a sulfuric acid anodizing bath results from the decomposition of the compound water (hydrogen oxide) that is present in this acid solution.

Since a symbol represents the weight of one atom of an element, the symbols of the elements comprising a compound could be used to represent the weights of the atoms in the compound. The compound silver cyanide consists of the elements silver, carbon, and nitrogen. The symbols representing this compound would be written as

Atomic Weights of Elements

Aluminum	26.97	Magnesium	24.32
Antimony	121.76	Manganese	54.93
Arsenic	74.91	Mercury	200.61
Barium	137.36	Molybdenum	96.00
Beryllium	9.02	Nickel	58.69
Bismuth	209.00	Nitrogen	14.01
Boron	10.82	Oxygen	16.00
Bromine	79.92	Palladium	106.7
Cadmium	112.41	Phosphorus	31.02
Calcium	40.08	Platinum	195.23
Carbon	12.00	Potassium	39.10
Chlorine	35.46	Radium	225.97
Chromium	52.01	Rhodium	102.91
Cobalt	58.94	Selenium	78.96
Copper	63.57	Silicon	28.06
Fluorine	19.00	Silver	107.88
Gallium	69.72	Sodium	23.00
Germanium	72.60	Strontium	87.63
Gold	197.2	Sulfur	32.06
Hydrogen	1.01	Tantalum	181.4
Indium	114.76	Tellurium	127.61
Iodine	126.92	Tin	118.70
Iridium	193.1	Titanium	47.90
Iron	55.84	Tungsten	184.00
Lead	207.22	Vanadium	50.95
Lithium	6.94	Zinc	65.38

AgCN. In this form it is called a "formula."

The smallest part of a compound is known as a molecule. This term also applies to elements under certain conditions. Oxygen, for example, is present as a gas in the atmosphere. In this form it is made up of a combination of two atoms. Under ordinary conditions of temperature and pressure most elements that are gases consist of two atoms (diatomic). A molecule can therefore be defined as the smallest part of an element or compound that can exist under normal conditions.

Law Of Definite Proportions

The smallest part of an element is known as an atom. The smallest part of a compound is known as a molecule. A molecule is represented by a formula. Since a symbol represents the weight of an atom of an element, a formula represents the proportion by weight of the elements in a compound. Referring to the table of atomic weights, the formula AgCN for silver cyanide is composed of 108 parts by weight of silver (Ag), 12 parts by weight of carbon (C), and 14 parts by weight of nitrogen (N) or, AgCN = 108 + 12 + 14 = 134. This is known as the molecular weight (formula weight) of silver cyanide. Since the composition by weight of the three elements, silver, carbon, and nitrogen, in the compound AgCN will always be found to be in the same proportion, these elements will always combine to form silver cyanide in a fixed or definite composition by weight. This holds true for all compounds and is, therefore, stated as the Law Of Definite Proportion. It is also called the Law Of Constant Composition.

The formula CrO_3 for chromic acid (anhydride) represents:

1 molecule of chromic acid (anhydride) CrO_3, consisting of

1 atom of chromium
weight = 52 × 1 = 52
3 atoms of oxygen
weight = 16 × 3 = 48

Weight of 1 molecule
(molecular weight) = 100

The formula representing the combining weights for chromium and oxygen in the formation of the compound CrO_3 will always be in the proportion or ratio of 52 parts by weight of chromium to 48 parts by weight of oxygen. The product, commonly called "chromic acid," that is added to the chromium tank, is known chemically as chromium trioxide, CrO_3. It dissolves in water, with which it combines, to form the reddish solution chromic acid. Such oxides are called anhydrides (Greek for lacking water). Hence CrO_3 is correctly known as chromic acid anhydride.

Mixtures

The evolution of hydrogen during the anodizing process requires adequate ventilation because it does not unite chemically with the oxygen in the air (unless ignited). Further, the amount of hydrogen that the air will hold does not follow any fixed or definite proportion. Since the hydrogen does not lose its properties, the term "mixture" is used to describe this condition. The ingredients of a mixture are merely placed together in varying amounts and do not conform to the laws of definite composition. Another example of a mixture of gases is the presence of hydrocyanic acid over a freshly prepared cyanide tank. It is considered a mixture because the hydrocyanic acid does not unite chemically with the components of the air. If present in such small amounts as .048 per cent, it constitutes a hazard.

When salts such as nickel chloride or nickel sulfate are added to a nickel plating solution, a mixture results because the amounts added may vary and the salts will retain their properties. As proof, if some of the solution from this bath is allowed to evaporate (a physical change) the salts that were added will be recovered.

Another example of a mixture is found in a type of alloy known as a solid solution. This is a mixture in which one metal is dissolved in another metal in varying proportions. Electrodeposited yellow brass containing from 20 to 38% zinc is an example. It is similar to a solution of a salt in water but differs in that this solution is solid at ordinary temperatures.

The proprietary alkaline cleaning mixtures available for cleaning metals are examples of mixtures. They are composed of salts and alkalies in different proportions. Sodium carbonate, trisodium phosphate, and tetrasodium pyrophosphate are common examples of salts used in cleaning mixtures. The alkali is usually sodium hydroxide (caustic soda). Surface active agents and chelates are also included in such mixtures.

The Periodic Law

That a relationship existed between the atomic weights and properties of elements was recognized by a number

of investigators. As early as 1829, J. W. Dobereiner called attention to such a relationship. He found that some elements with similar chemical properties could be arranged in groups of three (triads). When so arranged, the atomic weight of the middle element would be the approximate average of the other two. One group, for example, consisted of the following elements

Chlorine	35
Bromine	80
Iodine	127

$$\frac{3.5 + 127}{2} + 81.$$

This average value is the approximate weight of bromine.

Little progress was made with this scheme because a uniform set of atomic weights had not been established. In 1865, J. A. R. Newlands made the observation that elements when "placed in sequence according to their atomic weights arrange themselves in such manner that the eighth element will have properties similar to the first, the ninth similar to the second and so on." Because this indicated a rule of eight, Newlands called it the "law of octaves." The arrangement did not, however, follow a satisfactory order of elements. Iron by this scheme was grouped with sulfur and gold with iodine. Such a grouping did not compare logically with the properties of these elements.

An arrangement of elements that eliminated the discrepancies of the previous plans was one proposed in 1869 by D. I. Mendelejev. He named it the "Periodic Law." By arranging the elements in the order of their atomic weights, he found that a striking similarity of physical and chemical properties of the elements occurred at regular intervals or periods. For example, if the first two elements hydrogen and helium are omitted for the present, fluorine (F), the seventh element, will be in the same vertical column with chlorine (Cl), the fifteenth element. These two elements have similar properties. The same order holds true for lithium (Li) and sodium (Na), carbon (C) and silicon (Si) and so on. They are grouped by this arrangement into families of elements. For example, lithium, sodium, potassium, and rubidium form such a group or family. This group is known as the "alkali metals," because they form strong bases. The member of this family

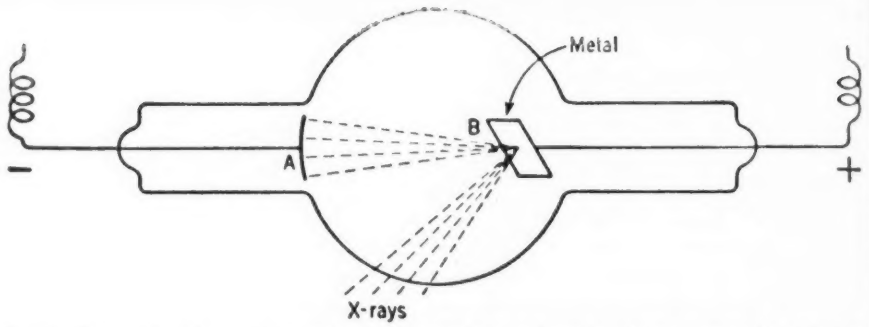

Fig. 2. X-ray tube. Electrons are emitted and brought to a focus by the concave cathode A. The cathode rays on striking a metal target, produce X-rays of a frequency characteristic of the metal.

familiar to platers, sodium hydroxide (caustic soda), is present in cleaning mixtures and in cyanide bath solutions. Another family of elements, grouped in vertical row 7, consists of the elements fluorine, chlorine, bromine, and iodine. This group of elements forms strong acids. Two members of this family, hydrofluoric acid and hydrochloric acid (muriatic acid), are commonly used for bright dips in electroplating. (See Table I)

Row 1.

Element:	Li	Be	B	C	N	O	F	Ne
Atomic Wt:	7	9	11	12	14	16	19	20

Row 2.

Element:	Na	Mg	Al	Si	P	S	Cl	A
Atomic Wt.:	23	24	27	28	31	32	35.5	40

Exceptions, however, occurred in several instances. Potassium (K), which has an atomic weight of 39, should occupy the space in the table shown by argon (A). Argon, however, resembles neon (Ne), in its properties, and potassium is similar to sodium and lithium. Hence, to present a satisfactory arrangement, potassium was placed in a third row under sodium, argon under neon. Two similar examples of irregular pairs are those of cobalt (Co) and nickel (Ni), tellurium (Te) and iodine (I). Later developments proved the correctness of this order. Since helium, an inert gas, resembles neon and argon in chemical properties, it was placed above neon in the table. The position of hydrogen in the table was difficult to explain. Because some of the properties resembled those of lithium and sodium, it was placed above these elements in the table. The table for the first three horizontal rows becomes:

	I	II	III	IV	V	VI	VII	VIII
Row 1:	H							He
Row 2:	Li	Be	B	C	N	O	F	Ne
Row 3:	Na	Mg	Al	Si	P	S	Cl	A

In spite of its exceptions, the arrangement proposed by Mendelejev presented an orderly classification for the chemical characteristics of elements. It advanced appreciably the discovery of elements. The impressive feature of this plan was his bold predictions. He contended that where the properties of an element did not conform with this periodic arrangement, a blank space should be left for the undiscovered element. That he was able to predict with great accuracy the physical and chemical characteristics of missing elements was confirmed in three instances. Gallium was discovered in 1875, scandium in 1879 and germanium in 1886. An example of this remarkable accuracy can be better appreciated by comparing the properties of germanium predicted by Mendelejev and those based on experimental results. Mendelejev called the element eka-silicon.

(*Concluded on page* 71)

Properties of Germanium	*Predicted, 1871*	*Found, 1886*
Atomic Weight	72	72.6
Density	5.5	5.47
Atomic Volume	13	13.2
Color of Element	Dirty grey, giving a white powder GeO_2 on calcination	Greyish-white metal giving a white powder GeO_2 on ignition
Action on Water	Metal will decompose steam with difficulty	Metal does not decompose water
Action on Acids	Slight	Metal not attacked by HCl

Shop Problems

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Tarnish Removal

Question: Can you advise us where we can get the formula for a non-poisonous solution for the removal of oxidation from sterling silver? Some of the instant proprietaries, such as Lewal's Instant Dip, are highly satisfactory for our purpose, but the expense involved is prohibitive.

We would greatly appreciate any information you can give us on the subject.

H. H. N.

Answer: "Instant Dip" is a 7% solution of thiourea, highly acidified but, strictly speaking, this solution could not be considered completely non-poisonous. A patent has been issued for this type of solution to Lowenheim (U.S. Pat. 2,628,199. Feb. 10, 1953).

Electroless Nickel

Question: We are interested in companies furnishing proprietary solutions or ingredients, particularly with regard to improvements, in the electroless nickel plating process. We would like to know what preparations are available and where they can be obtained and at what prices, etc. We would appreciate receiving this information as soon as possible.

Do you know if it is possible to deposit a gold-nickel alloy in this manner, and if so what companies can supply information on this project as well?

D. L. D.

Answer: The only commercial processes of which we are aware are the Bureau of Standards method and the Kanigen process of General American Transportation Corp. Both are described in the November and December issues of METAL FINISHING. General American does not sell the ingredients but licenses users.

The literature indicates no successful application of this process to the deposition of nickel-gold alloys.

Heat and Rust Resistant Black

Question: A camp grill-stove, which I am marketing through the mail, is made of 20 ga. sheet steel, cold rolled. The problem is to finish it. At present I am spraying them with dark grey lacquer primer coat. This gives a fairly black finish, but will, of course, burn off in use. Several considerations enter in making the decision as to the most desirable finish:

a) It should be reasonable in cost
b) It should keep the stoves from rusting during shipment and storage
c) It should have eye appeal: the dead black of a black oxide, or this metal primer seem adequate. I would like the blue-black native to the old fashioned stove pipe, but this is produced, I think, during maufacturing.
d) It should be easy to put on, and if possible, should hold up under heat.

D. G.

Answer: Caustic black finishes will withstand the heat but will not be rust resistant unless coated with an oil, lacquer or wax. A silicone base enamel may be suitable for your purpose. We would suggest you write to Dow Chemical Co., Midland, Mich. for information, unless your present lacquer supplier can assist you in this connection.

Record Stampers

Question: We are interested in electroforming phonograph stamping dies, and would like information on iron plating for making stampers .030" thick.

R. W. K.

Answer: Iron is not ordinarily used for record stampers, which are usually built up with nickel or with copper, faced with nickel. However, formulas and procedures for depositing all these metals will be found in the METAL FINISHING GUIDEBOOK.

Masking for Heavy Copper Plate

Question: We want to plate .005" of copper on certain areas of steel parts. The parts are approximately 9" long x 2½" wide x ½" thick. A small area of one end is to be plated. We must therefore mask off the entire area which will not be plated, or at least the area which will be in the copper solution. We have masking materials such as wax, stop-off lacquer for chrome, and tape, but they all either melt, blister or loosen in the cleaning or plating cycles.

With any of the masking materials we have used for heavy copper plating we find that the copper creeps beneath the edge of the masking. Is there a special technique of applying masking for heavy copper plating, or can you recommend a stop-off material for just such plating?

C. H.

Answer: You do not state whether you are using an acid or cyanide bath for building up the copper deposit. If a hot cyanide bath is being used, we doubt whether any material will adhere sufficiently well to eliminate creeping of the deposit under the edges by the time 0.005" thickness is built up.

We would suggest that a thin deposit be applied to the whole piece from the cyanide bath. Then stop-off, using lead-backed pressure sensitive tape. The parts can then be cleaned in a warm alkali, cyanide-dipped, acid-dipped, and acid copper plated. After building up the deposit, the stop-off is removed and the articles immersed in any of the common copper strippers. The thin deposit on the areas which were masked-off will strip off imme-

diately, without removing an appreciable proportion of the heavy deposit.

Salt Spray Testing

Question: We are urgently in need of a list of books published concerning salt spray testing, particularly the history.

L. R. M.

Answer: The first reference on the subject in our files is an article by J. A. Capp, Proc. American Soc. for Testing Materials, **14**, 474 (1914), copies of which are obtainable as microfilm or photostats from the New York Public Library.

Books containing chapters on the subject are:

Corrosion Handbook, Edited by H. H. Uhlig;

Corrosion Testing Procedures, by F. A. Champion.

Both books are published by John Wiley & Sons, 440 Fourth Ave., New York City.

A section on salt spray testing procedures and specifications will also be found in the METAL FINISHING GUIDEbook.

Anodes for Rhodium Plating

Question: I have a question I would like to have answered in the shop problems of METAL FINISHING. Is it possible to barrel plate in rhodium solution using lead anodes instead of platinum? If so, what type of lead should be used?

R. E. M.

Answer: Chemical lead anodes may be used instead of platinum. However, we would suggest graphite which, although it will disintegrate slowly and darken the color of the plating solution, will not contaminate it.

Electroformed Injection Molds

Question: We want to try out the most economical type of electroformed plastic injection molds for our production necessities of 5-20,000 pieces per mold. Pure copper did not resist the pressures, so we would like to try stress free, nickel forms, nickel-cobalt forms and copper-2% beryllium.

W. K.

Answer: Injection molds are generally electroformed from nickel or from iron since copper will not withstand the pressure. There is no method for electrodepositing beryllium-copper alloys; however, formulas and procedures for iron and for nickel appear in the METAL FINISHING GUIDEBOOK.

To produce a cobalt-nickel alloy, it is only necessary to substitute cobalt sulfate and cobalt chloride for part of the respective nickel salts. The amounts to be used will depend on the operating conditions and the desired deposit composition.

Salt Water Resistance

Question: We are considering making fishing lures of steel and bright nickel plating for protection and appearance. These will be used in salt water as well as fresh. Can you recommend a minimum thickness of nickel to withstand these severe conditions?

J. P. C.

Answer: The thickness of the nickel plate on steel is not as important as absence of porosity. Therefore, it is not possible to recommend a minimum thickness of deposit to withstand salt water exposure.

It is suggested that the lures be made of brass rather than of steel. If practicable, Monel, which would not require any plating, would be the most desirable material from which to construct the lures, as it doesn't corrode in salt water.

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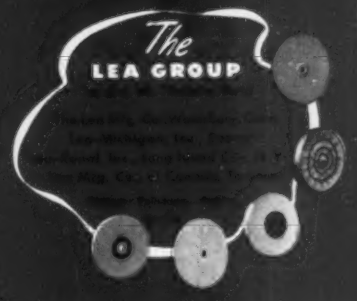

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Rust-Preventive Compositions

U. S. Patent 2,687,376. *Aug.* 24, 1954. *J. D. Spivack, assignor to Tide Water Associated Oil Co.*

A composition comprising a substantially non-corrosive vehicle in major amount based on the weight of the composition and a small amount, sufficient to impart rust-inhibiting properties, of a rust-inhibiting di(N-carboxyalkylalkanamide) in which the alkanoyl radical of the alkanamide grouping is an alkanoyl residue of a long chain fatty acid.

Cladding Metal

Reissue U. S. Patent 23,861. *Aug.* 31, 1954. *E. T. Clayton, assignor to Peen Plate, Inc.*

A method of cladding metal articles with a metal selected from the group consisting of tin, lead, cadmium, zinc, aluminum, magnesium, copper, silver, gold and alloys thereof, which method comprises mixing said articles (with pieces of impacting material in a liquid carrier *with impacting material selected from the group consisting of said articles and pieces of impacting material, said liquid carrier* containing particles of said selected metal in amount sufficient to provide a desired thickness of cladding metal on said articles and in proportion ranging from 1/480 to 4/3 of the combined weight of said articles and impacting material, said carrier liquid being in amount between .143 and 100 of the weight of the metal dust particles and including dispersed therein an organic surface-active, film-forming compound unreactive with said carrier liquid and selected from the group consisting of the fatty acids of 6 to 22 carbon atoms and the amines and amides of said acids, said compounds being present in amount in the range of the order of .7 to .001 of the carrier liquid by weight and at least sufficient to substantially cover said articles and to enclose and protect the powder particle surfaces with molecularly thin films, forcibly impacting and rubbing said film-coated dust particles in admixture in said carrier liquid onto the surfaces of said articles to flatten said particles and rupture said films and bring the particles in metal to metal contact with the said surfaces and with each other, the temperature of the treating carrier liquid being at least equal to the minimum temperature of recrystallization of the said metal particles to clad said surfaces with adherent surface layers of said flattened particles with entrapment of residual inclusions of said film-forming compound retained in random distribution among said flattened particles of said cladding layer, and continuing said impacting and rubbing of said film-coated particles onto said adherent surface layers to build up said surface layers to desired thickness on said articles.

Method of Bonding Aluminum to Steel

U. S. Patent 2,687,565. *Aug.* 31, 1954. *R. A. Schaefer, J. F. Cerness and W. H. Morrison, assignors to Clevite Corp.*

A method of making a bimetallic material composed principally of a ferrous layer and a layer of aluminum or aluminum alloy which consists of electrodepositing a layer of a metal selected from the iron group or its alloys in which cobalt is at least 50% of the alloy and successively coating upon this layer a second layer of mercury before the first metal oxidizes and lastly casting upon said second layer a layer of aluminum.

Method of Forming an Oxide Coating on Tin

U. S. Patent 2,687,994. *Aug.* 31, 1954. *J. J. Russell and H. N. Headland, assignors to Ekco Products Co.*

In the formation of a heat absorbing tin oxide coating on a tin article, the process which comprises making the article the anode in an electrolyte solution, passing current through said electrolyte solution to form a film oxide coating on the article, removing the tin article from the electrolyte to an elevated temperature from about 190° C. to 230° C. to convert said oxide to green oxide of tin.

Buffing Wheel

U. S. Patent 2,687,602. *Aug.* 31, 1954. *G. R. Churchill.*

As a new article of manufacture, a buffing wheel section, comprising: a ring of elongated individual cloth buffing elements initially of rectangular configuration, the individual cloth buffing elements having their longitudinal axes substantially coinciding with radii of the buffing wheel section and being composed of a small number of plies so that the element is flexible and not stiff, said buffing elements also being folded longitudinally thereof to provide confronting wing portions extending circumferentially in the same general direction from the longitudinal fold between said wing portions, one of said wing portions being reversely folded on itself to provide more plies therein than are present in the other wing portion whereby one wing portion is rendered more flexible than the other, the inner end of each buffing element being compressed and bunched into a solid substantially cylindrical form and disposed in side by side relation with respect to adjacent buffing elements in said ring, said buffing elements being partially nested radially outwardly from their bunched inner ends and being otherwise disconnected from one another except at their bunched inner ends, the bunching of the inner ends of said buffing elements cooperating with the flexibility of the same to effect flaring of the unbunched portions and the separation of the plies thereof at and near the working face of the buffing wheel section when in use, whereby to facilitate air cooling thereof and to impart to the working face of the buffing wheel section a honeycomb structure of broken appearance formed by the separation of

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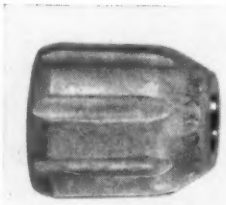

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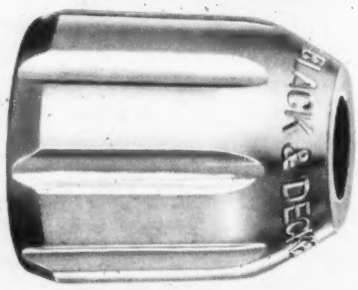

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said plies and the interstices between adjacent plies of the individual buffing elements; a rigid disk; and means extending through and fastening the inner bunched ends of said buffing elements to said disk, said honeycomb structure allowing the individual buffing elements at the working face of the wheel to flex both radially and laterally about the fastened bunched inner ends of said buffing elements when the work is pressed against the wheel to impart nonstreaking characteristics to the finish on the work.

Corrosion Preventive Composition

U. S. Patent 2,687,965. *Aug.* 31, 1954. *K. F. Schiermeier, assignor to Shell Development Corp.*

A composition of matter adapted for use as a rust inhibitor for metals containing the following constituents in the following proportions:

	% weight
Non-air blown, propane precipitated petroleum resin	55
Blown rapeseed oil	15
Mineral spirits	30

Method and Apparatus for Plating Pipe

U. S. Patent 2,689,215. *Sept.* 14, 1954. *S. G. Bart.*

In an electrolytic cell for electroplating the bores of pipes when rotating about their own axes and horizontally disposed, the combination of a pipe to be plated forming the cathode element of a cell, a plating head into which an end of the pipe projects and which head includes a closure plate fixed in a space, a hollow anode construction of squirrel-cage type located in the bore of the pipe, of materially less external diameter than the internal diameter of the pipe and rotatable about an axis offset from the axis of rotation of the pipe, means for mounting the pipe with its axis of rotation fixed in space, said anode construction including end members, a plurality of anode rods having their ends carried by the end members and the balance of the rods being exposed to the pipe and to the electrolyte of the cell, and means for rotating the cathode element and the anode element, said rotating means including a drive shaft journaled in the fixed closure plate directly engaging one of the end members in axial prolongation of the same and having said offset axis fixed in space to turn the squirrel cage anode construction about its own axis.

Electrodeposition of Copper

U. S. Patent 2,689,216. *Sept.* 14, 1954. *R. P. Nevers and E. W. Palmer, assignors to The American Brass Co.*

A process for the electrodeposition of substantially pure phosphorus-free copper in which an electric current is passed from a soluble copper anode through an aqueous electrolyte to a cathode, characterized in that the anode is composed essentially of a phosphorus-bearing copper containing 0.01% to 0.1% phosphorus, impurities normally present in commercial refined copper, and the balance copper, whereby an adherent film forms upon the surface of the anode and the surface of the corroding anode remains smooth throughout its useful life.

Detergent Compositions

U. S. Patent 2,689,225. *Sept.* 14, 1954. *D. E. Anderson and W. F. Wegst, assignors to Wyandotte Chemicals Corp.*

A detergent composition consisting essentially of 20-70% of an alkaline detergent salt selected from the group consisting of sodium carbonate, sodium bicarbonate, modified soda, disodium orthphosphate, trisodium orthophosphate, sodium metasilicate, sodium sesquisilicate, water glass, borax and sodium borate, 15-60% of an alkaline condensed phosphate salt selected from the group consisting of tetrasodium pyrophosphate and those polyphosphates of the calcium and magnesium ion sequestering type whose Na_2O/P_2O_5 ratios range from 1:1 to 1.67:1, and 5-25% chlorinated trisodium phosphate.

Plated Wire

U. S. Patent 2,689,399. *Sept.* 21, 1954. *A. N. Gray, assignor to Western Electric Co.*

A composite electrical conductor, consisting essentially of a high tensile strength steel core, a corrosion protective thin inner layer on zinc covering the steel core, an intermediate thin barrier layer of lead covering the zinc layer, and an electrodeposited outer conductive layer of copper covering the lead layer and having a thickness of about one-eighth of the radius of the composite conductor.

Bright Dipping Lead

U. S. Patent 2,689,785. *Sept.* 21, 1954. *A. C. Simon, assignor to the United States of America.*

A method of producing a polish of high luster on a lead surface which

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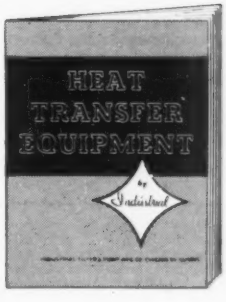

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*For use under Patent No. 2,689,216

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comprises immersing the lead surface in clean smooth condition into an aqueous polishing solution of hydrogen peroxide and acetic acid and vigorously agitating it therein for a time sufficient to develop a polish of high luster thereon, quickly washing the polishing solution from the lead surface with aqueous acetic acid of a concentration not appreciably less than that of the polishing solution and then washing the lead surface with water to remove the acetic acid, said polishing solution containing between about 10 and 25% by weight hydrogen peroxide and between about 15 and 70% by weight acetic acid in inverse proportion and in a weight ratio of acetic acid to hydrogen peroxide which for each unit of 5 weight percent of acetic acid decreases with increase in the hydrogen peroxide content by a factor which is about 3.3% for each 1% increase in weight of the hydrogen peroxide.

Vacuum Metallizing

U. S. Patent 2,689,805. *Sept.* 21, 1954. *M. W. Croze and P. L. Hedrick, assignors to Minnesota Mining & Mfg. Co.*

The method of providing a thin, flexible, continuous, firmly bonded metallic coating on a surface of a sintered thin polytetrafluoroethylene film, comprising forming an unsintered self-supporting polytetrafluoroethylene film, placing said film under vacuum and depositing thereon, from vapor state, a thin continuous metallic coating non-fusing at the sintering temperature of the polytetrafluoroethylene; and then heating and sintering the thus coated film without fusing said metallic coating.

Impact Plating

U. S. Patent 2,689,808. *Sept.* 21, 1954. *E. T. Clayton, assignor to Penn Plate, Inc.*

The method of metal plating successive batches of metal articles comprising mixing a batch of said articles with a quantity of particles of metal powder calculated in proportion to the amount of coating desired on said articles and less than thirty percent of the articles by weight and being in suspension in an aqueous solution from four to twenty times the particles by weight and containing between 0.1 and 2.0 percent of an organic, film-forming, plating agent, agitating said mixture and spreading said plating agent, as organic molecular films on the metal surfaces and developing high pressures between the metal surfaces of said articles and particles of said mixture parting said films at the areas of contact and bringing said surfaces together in metal to metal contact with each other and progressively depositing and attaching said particles to the article surfaces and to each other to gradually deplete said suspension and build up said particles into continuous dense metal coatings on the surfaces of said articles, and continuing said agitation of said mixture and the building up of said coatings to desired thickness thereof by deposit of at least 80 percent of said particles and with the depletion of the suspended particles to less than 20 percent, removing said batch of coated articles and separating and discarding said aqueous solution and mixing another batch of metal articles with less than thirty percent by weight of particles of metal powder in suspension in an aqueous solution four to twenty times the particles by weight and containing between 0.1 and 2.0 percent of an organic, film-forming, plating agent and repeating the agitation of said mixture and the filming of the metal surfaces and the progressive building up of the desired dense surface coatings as with the first batch of articles and removing the coated articles and discarding the aqueous solution as in the treatment of the first batch of articles, and similarly treating successive batches of articles to

plate dense adherent metal coatings on the surfaces of said articles of each batch.

SCIENCE FOR ELECTROPLATERS

(*Concluded from page* 64)

An arrangement of the periodic table that eliminated the exceptions noted in Mendelejev's classification was based upon the atomic number of the element instead of the atomic weight. This order was the result of the observations made by H. G. J. Moseley in 1913. He found that photographs of X-rays emitted by various elements, when made the target in an X-ray tube (Fig. 2), showed an increasing charge (atomic number) with an increase in atomic weight. Potassium, by this study, was found to have an atomic number of nineteen and argon eighteen, giving these elements the correct order in the periodic table. However, with the exception of these irregular pairs — argon and potassium, cobalt and nickel, telleurium and iodine, which now fit into their proper places — the order in the table was identical with the arrangements of the elements based upon their atomic weights. The classification of the elements by this method had this advantage: the elements were grouped as families of elements in the order of their chemical properties. There were no exceptions to this rule.

The law now states: The chemical properties of the elements are a periodic function of their atomic numbers." The table contains the elements grouped into eight vertical columns or groups. Elements in the same vertical columns possess similar properties. The horizontal rows are called periods and indicate the repetition of elements of the same family. Thus, lithium in horizontal row 1 is followed by sodium in row 3 and potassium in row 4. The fourth period contains eighteen elements instead of eight. This is called a long period. This is necessary so that rubidium (Rb), the next element similar to lithium, sodium, and potassium, will fit into its proper place, namely vertical row I. The periods following number IV present similar situations and the arrangement described satisfies the atomic number scheme. In the table (Fig. 3), the atomic number is indicated to the left of the element, the atomic weight below the element.

	I A	I B	II A	II B	III A	III B	IV A	IV B	V A	V B	VI A	VI B	VII A	VII B	VIII
1	1 H 1.0080														2 He 4.003
2	3 Li 6.940		4 Be 9.02		5 B 10.82		6 C 12.010		7 N 14.008		8 O 16.0000		9 F 19.00		10 Ne 20.183
3	11 Na 22.997		12 Mg 24.32		13 Al 26.97		14 Si 28.06		15 P 30.98		16 S 32.066		17 Cl 35.457		18 A 39.944
4	19 K 39.096		20 Ca 40.08		21 Sc 45.10		22 Ti 47.90		23 V 50.95		24 Cr 52.01		25 Mn 54.93		26 Fe 55.85	27 Co 58.94	28 Ni 58.69
		29 Cu 63.54		30 Zn 65.38		31 Ga 69.72		32 Ge 72.60		33 As 74.91		34 Se 78.96		35 Br 79.916	36 Kr 83.7		
5	37 Rb 85.48		38 Sr 87.63		39 Y 88.92		40 Zr 91.22		41 Nb 92.91		42 Mo 95.95		43 Tc 99		44 Ru 101.7	45 Rh 102.91	46 Pd 106.7
		47 Ag 107.880		48 Cd 112.41		49 In 114.76		50 Sn 118.70		51 Sb 121.76		52 Te 127.61		53 I 126.92	54 Xe 131.3		
6	55 Cs 132.91		56 Ba 137.36		57 - 71 *		72 Hf 178.6		73 Ta 180.88		74 W 183.92		75 Re 186.31		76 Os 190.2	77 Ir 193.1	78 Pt 195.23
		79 Au 197.2		80 Hg 200.61		81 Tl 204.39		82 Pb 207.21		83 Bi 209.00		84 Po 210		85 At 211	86 Rn 222		
7	87 Fr 223		88 Ra 226.05		89 - 98 **												

* Rare Earths

57 La 138.92	58 Ce 140.13	59 Pr 140.92	60 Nd 144.27	61 Pm 147	62 Sm 150.43	63 Eu 152.0	64 Gd 156.9	65 Tb 159.2	66 Dy 162.46	67 Ho 164.94	68 Er 167.2	69 Tm 169.4	70 Yb 173.04	71 Lu 174.99

** Radioactive Rare Earths

89 Ac 227	90 Th 232.12	91 Pa 231	92 U 238.07	93 Np 237	94 Pu 239	95 Am 241	96 Cm 242	97 Bk 243	98 Cf

Fig. 3. The Periodic Table.

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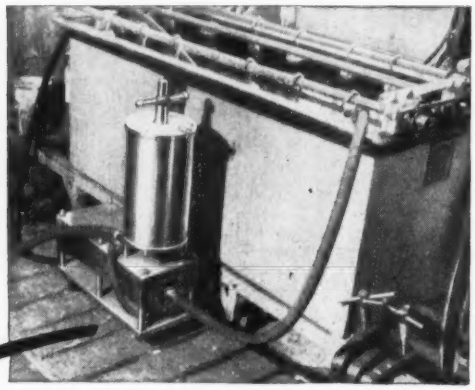

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ABSTRACTS

Red Gold Alloy Plating

O. Loebich: *Metalloberflaeche.* Vol. 5, No. 4, p. B 60.

A series of commercial processes have been developed for the production of the reddish gold alloys. In addition to the gold salt in the bath, a copper salt and sometimes a silver salt are added. It is, however, not possible to entirely prevent the formation of hydrogen bubbles on the ware during the deposition of the red-toned gold alloys. In addition to the metal ions which form the alloy coating, hydrogen ions are also discharged and this has numerous noteworthy results. It introduces difficulties in calculating the amount of gold or the thickness of its coating as the cathode efficiency is less than 100%. The current efficiencies are generally about 50 to 70%. As the fine gold content of the deposit also tends to alter with the current efficiency, it is not always easy to hold this to the pre-determined value.

Finally, the copper, as completely opposed to the silver, enters into no mixed crystal formation with the gold during plating. A copper-gold deposit consists of sub-microscopic gold and copper grains mixed with one another but of which either consists only of copper or of gold atoms respectively. An electroplated red gold deposit thus has certain of the non-noble characteristics of the copper. It can suffer surface discoloration and it is not resistant to hot nitric acid. What holds good for the red gold alloy plating has also been found to be the case with the present-day fashionable yellow, champagne colored or rose toned gold alloy deposits. In the cases examined it was proved that the copper had not entered into mixed crystal formation and this held good even when the gold content amounted to around 90% and the copper content to only 6-7%.

Accordingly, there is always present the danger that the copper grains will become exposed at the surface of the deposit and cause dscoloration or color darkening. The hardness of red gold plate is moderate to very high. Testing with nitric acid (density=1.2) showed at times, particularly when the fine gold content was under 80%, an attack of the copper grains in the coating by the acid. The red gold coatings also tend more to porosity than do silver-gold plates. The red gold baths gas and the plate is frequently deposited in a somewhat porous condition.

Red Gold Alloy Plating

B. Wullhorst: *Metalloberflaeche.* Vol. 7, No. 4, pp. A 55-A 56.

Copper is one of the few non-noble metals which deposits with gold in a satisfactory surface condition. Although the deposition potentials of gold and copper are located sufficiently near together, according to the author's observations which have been confirmed in other quarters, when the current density is increased the transition of the yellow of the fine gold to the red color of the red gold alloy often proceeds with a sudden change. More finely graduated stages can generally be obtained only in older or artificially aged baths. The reverse behavior has also been encountered, that a red gold deposit suddenly becomes of a more fine gold color and it is only with considerable increase in current density that the codeposition of the copper can be induced. Generally speaking however, copper behaves as every other non-noble metal which can be co-deposited with gold, with only the one exception that in baths which contain only copper and gold,

raising the bath temperature strengthens the red color of the alloy instead of weakening it towards the yellow. For toning the red color, silver, cadmium or nickel can be added to the baths. With the exception of nickel, the amounts added must be extraordinarily small and it is not always an advantage to prepare the bath with a high copper content.

It is difficult to conduct red gold alloy plating in coating thickness of more than 10 microns in spite of the fine grained deposit which is often observed and which can be obtained brilliant at temperatures around 40°C. and with agitation. The red gold deposits are characterized by great hard ness and hardness values of over 300 Vickers units can be obtained. The brittleness which is associated with this hardness rises with increasing copper content in the alloy and is evinced by hair-line cracks which only make their appearance after a long time and generally pass through to the base metal. To prevent the well-known surface discoloration of the red gold alloy plate, the article can be heated to about 300°C. for a short time by which mixed crystal formation takes place. If it is desired to retain the hardness of the plated alloy, the heat treatment in no case should be conducted at any appreciably higher temperatures than this. With the brilliant coatings, which often contain organic constituents from the bath, this can often lead to porosity of the coating and similar defects.

Bath Conditions with Gold Plating

A. D. *Galvano* (Paris). Vol. 22, No. 199, pp. 11-12.

The metallic content of gold plating baths is often a subject of contention. For a classic bath, a total concentration of 1.5 to 2.5 g./l. would appear to be sufficient. A concentration of 10 g./l. conducting salts is considered sufficient. The salts used, disodium phosphate, sodium bicarbonate and sodium sulfite should be of high purity. Impurities can lead to lack of brilliancy, the appearance of streaks, rapid tarnishing, etc. Other things being equal, a critical factor in connection with the operation of all gold plating baths is the current conditions. The employment of high voltages can cause the rapid decomposition of the cyanide and the formation of an appreciable cathodic film which can attain in some cases the thickness of 25 microns. The most favorable voltage zone is located between 3 and 5 volts. The current intensity has a major importance in the case of the electrodeposition of gold alloys. According to the amperage utilized one can deposit each metal in the almost pure state, this without modifying the other physico-chemical constants. It is advisable to work between 0.5 and 1.0 amps./sq. dm. according to the tone desired. If, under conditions of determined current, the deposits obtained do not have the normal tint, it is necessary to check the temperature, pH and free cyanide content.

The temperature effect can be approximately equivalent in result to that of the current density. By increasing the bath temperature without altering the voltage or current density, deposits will be obtained which will increase in gold content in the case of the gold-silver baths and decrease with the gold-copper baths. As the bath temperature increases so also will the conductivity increase. Prolonged and excessive heating however, will cause the decomposition of the cyanide. This decomposition commences around 50°C. and attains its critical point at 70°C. It is recommended to employ bath temperatures which will vary between 40° and 60° as the maximum.

Recent Developments

New Methods, Materials and Equipment for the Metal Finishing Industries

Copper Cyanide

Copper Pigment and Chemical Works, Inc., Dept. MF, 215 Bayway, Elizabeth, N. J.

Copper cyanide, recently available from only a single source in the United States, is now also being produced in large-scale commercial quantities by the above manufacturer.

The new competitive position of this vital plating chemical promises to be of great benefit to the automotive plating industry and to appliance manufacturers, who employ large quantities of the material in the copper undercoating of chrome-plated hardware and fixtures. The new copper cyanide is of premium grade and is marketed in the form of a free-flowing white powder of high purity and high solubility.

A free sample is available on request by writing to the company.

Motor Operated Tap Switch

The Udylite Corp., Dept. MF, 1651 E. Grand Blvd., Detroit 11, Mich.

A new motor operated Furnas Single Knob Tap Switch for use with regulated rectifiers can be integrally mounted on any Udylite 1,500 ampere to 6,000 ampere rectifier with a remote raise and lower push button located on the meter panel. This means that the rectifier with built in regulator can be located away from the tank yet completely controlled from the standard meter panel at the operator's position, saving floor space where most needed. Regulation is the same as the manual switch with 22 positions from minimum to maximum.

If desired, automatic voltage, current or current density control can also be furnished. Delivery from Detroit is at present 6 weeks.

The Udylite Motor Generated Tap Switch mounted on a 3,000 ampere Selenium Rectifier. Operator's control panel shown at lower right.

Corrosion-Resistant Lining Compound

Pennsylvania Salt Mfg. Co., Dept. MF, 1000 Widener Bldg., Philadelphia 7, Pa.

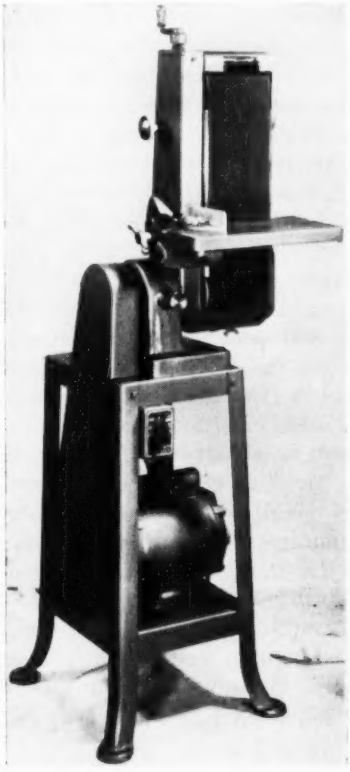
A new corrosion-resistant Neoprene lining compound flows on like paint to a variety of industrial surfaces—fan blades, fume ducts, process vessels, pump impellers, valves and piping. The product, called NeoLine, combines the corrosion inertness of Neoprene with excellent strength and adhesion. It cures completely to a live, resilient vulcanized coating for full protection for metal, concrete or wood where heavy duty coating or lining is required. It can be heat-cured or air-cured.

Exhaustive service tests in eight chemical plants have proved several outstanding features of the new product. One feature is its flexibility of application. It can be applied equally well to irregular shapes and surfaces as well as plain surfaces. Its excellent flow qualities permit easy application by brush, roller, spray or dip methods. Tests also showed a wide range of resistance to corrosives up to 200 degrees Fahrenheit.

Another advantage the compound offers industrial plants is long storage life. Curing accelerators for the coating are packaged separately and are mixed just prior to application. A choice of accelerators is available for various methods of application.

Budget Priced 6" Belt Sander

Engelberg Huller Co., Dept. MF, 831 West Fayette St., Syracuse, N. Y.



Principal applications of the Model 648 belt grinder include free-hand work such as flat surfacing, squaring, rounding, deburring, chamfering, and polishing. Priced at $165.00, the belt grinder also provides a low-cost way for companies to do pilot work with abrasive-belt grinding on operations in their own plants.

It is adjustable to either vertical or horizontal position (or to any intervening angle) in only 5 seconds. Its 6" belt is backed by an unusually large platen, 6⅜" x 14⅛", and will handle fairly large as well as small pieces. In horizontal position, very long pieces overhanging the ends of the machine can be worked.

The work table is adjustable to 45° from belt, 20° toward belt, and is slotted for an adjustable angle gauge calibrated for any angle up to 90°.

Belt changes can be made in less

THE BEST OF BOTH—
In one unbeatable line!

When J. C. Miller joined forces with Hanson-Van Winkle-Munning recently, the nation's two best sources of buffing and polishing compounds became one. Each of these two compound sources offered specific advantages and unique products—uniting them meant the creation of one master compound line, a line unequalled anywhere.

NOW—FROM ONE SOURCE—YOU GET—

AN ENLARGED FIELD SERVICE AND RESEARCH STAFF, better equipped to help you with your buffing problems.

FASTER, BETTER, MORE ECONOMICAL SERVICE AND DELIVERY—increased manufacturing and warehousing facilities across the United States.

SIMPLICITY—from one compact line you can choose the exact compound to meet every conceivable buffing requirement.

ONE SOURCE—ONE RESPONSIBILITY...whatever your buffing problem, rely on the new, expanded H-VW-M line to fill *all* your buffing and polishing compound requirements.

ALL TYPES

Liquid
Cast
Extruded
Greaseless
Hand-Rolled
Water Dispersible
Automatic Shapes & Sizes

For complete information ask for Bulletin

PLATEMANSHIP

Your H-VW-M combination—of the most modern testing and development laboratory—of over 80 years experience in every phase of plating and polishing—of a complete equipment, process and supply line for every need.

HANSON-VAN WINKLE-MUNNING COMPANY
Main Office and Plant, Matawan, New Jersey
J. C. Miller Division, Main Office and Plant, Grand Rapids, Mich.
SALES OFFICES: Anderson (Ind.) • Baltimore • Beloit (Wisc.) • Boston Bridgeport • Chicago • Cleveland • Dayton • Detroit • Grand Rapids • Los Angeles • Louisville • Matawan • Milwaukee New York • Philadelphia • Pittsburgh • Plainfield • Rochester St. Louis • San Francisco • Springfield (Mass.) • Utica Wallingford (Conn.)

H-VW-M

INDUSTRY'S WORKSHOP FOR THE FINEST IN PLATING AND POLISHING PROCESSES • EQUIPMENT • SUPPLIES

DEMING pumps for metal finishing plants

The unit illustrated is a Deming Fig. 4700 Vertical Turbine Pump equipped with a short length of column to place the suction inlet at the proper location.

Hot water alkaline solution at temperatures from 180° to 210°F. is pumped through spray nozzles to a scrubbing machine to clean the acid from steel sheets after the pickling process.

The important advantages of Deming Vertical Turbine Pumps for this type of service are the elimination of priming problems and the ease with which submergence may be provided to prevent vapor locking with liquids near the boiling point.

THE DEMING CO., 567 BROADWAY, SALEM, OHIO

75th ANNIVERSARY DEMING PUMPS 1880 · 1955

The complete line of Deming Industrial Pumps covers a wide range of types, sizes and capacities to meet most requirements of the plating and allied industries. A nationwide network of Deming Distributors assures localized service everywhere. Write for complete details.

Specify DEMING PUMPS

than 60 seconds without tilting the idler pulley. The operator simply opens the hinged top cover and side guard, turns a crank to release belt tension, slips old belt off and new belt on, tightens crank — and the grinder is again ready for operation. A large knob on the side regulates tracking.

Drive units are optional, and include 1 HP, 60-cycle motors in single phase at 110/220 volts, or in three phase at 220/440 volts. Belt speeds of 2,800 and 4,000 SFPM are available with a 1,725 RPM motor.

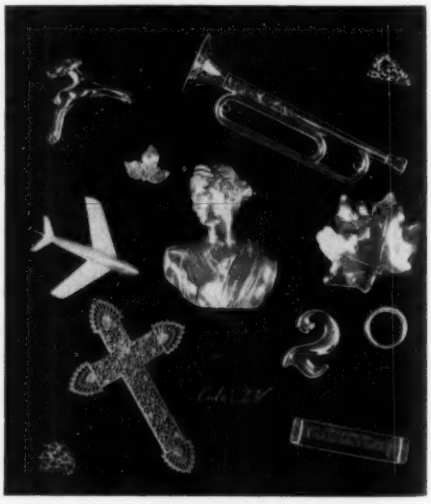
Occupying less than 3 square feet of floor space, the 648 presents a compact answer to the need for a ready-at-hand grinding tool with minimum displacement of valuable production area.

Spray Metallizing

Jema Chemical & Supply Co., Dept. MF, 191 South St., Newark 5, N. J.

Spray metallizing, a new process recently introduced by the above firm is claimed to produce a hard, durable high luster finish requiring no treatment beyond the protective coating, and to reach down into the deepest intercises or undercuts, without polishing. The resulting top coat may be left clear with a rich silver-chrome appearance, or may be dyed gold, brass, copper, or one of many other colors suitable to the final product.

The process requires only seconds,



and can be operated mechanically or by relatively unskilled labor. There are no limitations as to the size, shape, or weight of items which can be processed.

In addition to standard finishing room equipment (air compressor, lac-

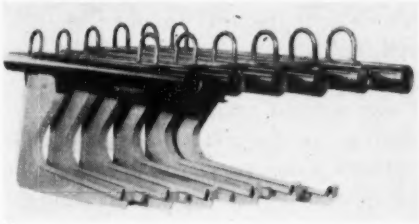
quer booth, baking oven, racks or jigs), the only equipment required is a spray metallizing booth plus a few specialized accessories to operate the same. The manufacturer states this additional equipment can be installed in the average plant for as little as $200.

Many times more durable than silver spray techniques now used as a substitute for vacuum metallizing, the spray metallized surface, it is claimed, will stand 200 hours at 120 deg. F. in 100% humidity and sulphur atmosphere with no loss of adhesion or tarnish.

The company supplies coatings and finishes and technical assistance in setting up the process in any plant in the United States.

Monel Pickling Hooks

Lewis Welding & Engineering Corp., Dept. MF, 81 Interstate St., Bedford, O.



A new line of acid-resistant Monel hooks for use in pickling operations is of all-welded construction. These hairpin-type hooks feature a specially-designed drip trough on the load bar that picks up condensate and carries it out beyond the rod bundles. This design feature is particularly important during progressive cleaning operations.

To meet a wide range of requirements, the hooks are available in two types and six standard sizes. Hooks of "I"-section construction are supplied for applications involving maximum load capacities up to 3,000 pounds. For heavier duty uses, hooks of box-section construction are furnished. These hooks will support up to 4,000 pounds. Length of load-supporting section ranges from 4 to 8 feet, depending upon size and construction of hook. All hooks are bolted to steel spreader bars which can be replaced quickly and economically whenever necessary.

For extremely corrosive pickling operations, the manufacturer can supply special one-piece all-welded hooks and spreader bars of all Monel construction.

Cut anode costs more than ½!

For a given length of anode rod you may, for example, buy three 22-inch, 3-rib conventional extruded lead anodes. *Price would probably be about $5.60 each. Total: $16.80. These anodes would last you about 9 months in normal service. Cost per month: $1.87.

For the same length of anode rod you would need two 22-inch Conducta-Core anodes at about $17.50 each. *Total: $35.00. BUT the Conducta-Core anodes will last you 3½ years! Cost per month: $.83!

The answer is the unique design. The challenge is to see for yourself. Try Conducta-Core now.

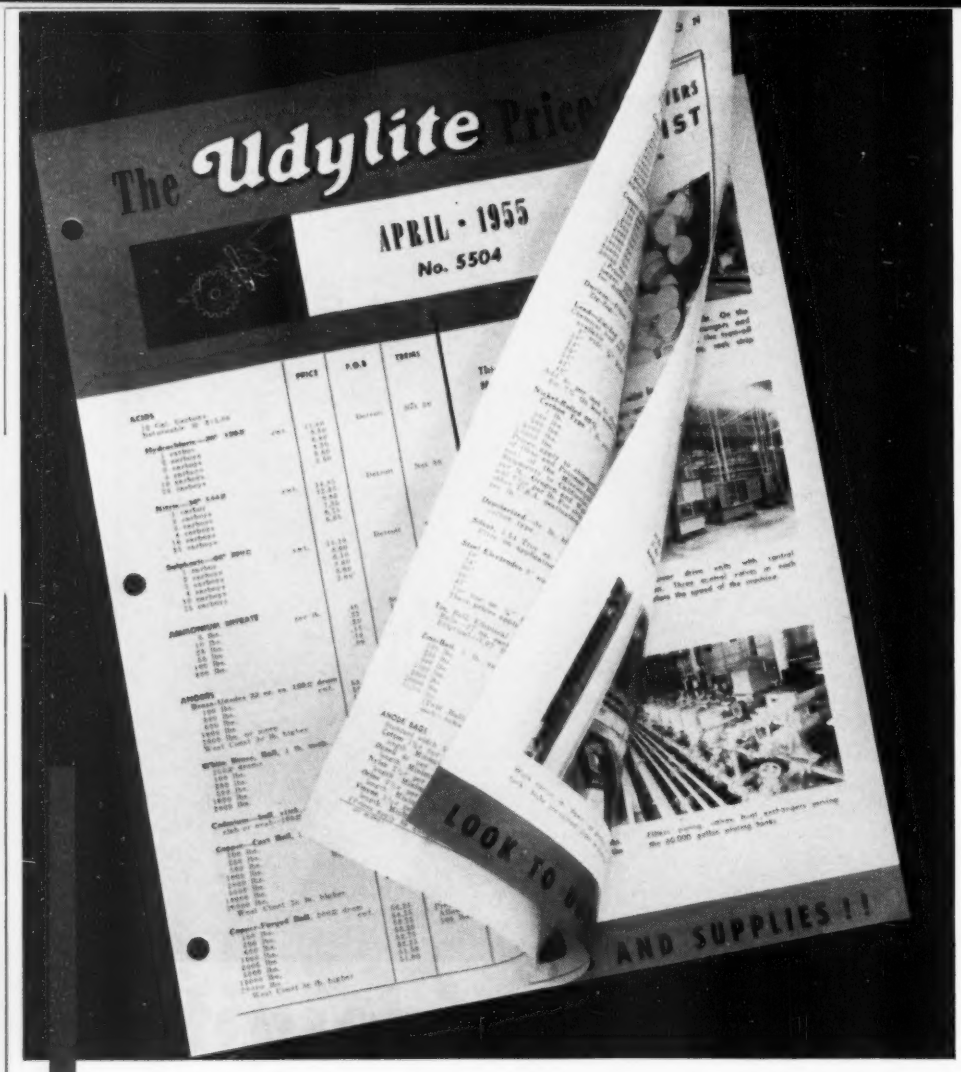
**These prices are approximate. They vary with market conditions but since both are dependent upon the price of the base metals of which they are made, the relation between them remains much the same.*

Photo courtesy U. S. Metals Coatings Co., Inc., Elizabeth, N. J.

Federated Metals Division

AMERICAN SMELTING AND REFINING COMPANY
120 BROADWAY, NEW YORK 5, N. Y.
In Canada: Federated Metals Canada, Ltd., Toronto and Montreal

Aluminum, Magnesium, Babbitts, Brass, Bronze, Anodes, Zinc Dust, Die Casting Metals, Lead and Lead Products, Solders, Type Metals



THIS SERVICE WAS DESIGNED FOR YOU

A lot of profits can roll out the back door of your plating shop if you fail to keep up-to-date on prices of the hundreds of items you use every day. That is why Udylite, as another of its many free services to electroplaters, publishes the Price Guide—a monthly price listing of important items regularly used by the trade, as well as information about new developments in equipment and processes.

It pays to buy supplies from Udylite—you can be sure of top quality, accurate weight and pricing—that Udylite stands back of every sale. You can be sure of prompt delivery too, as Udylite has widespread warehousing service.

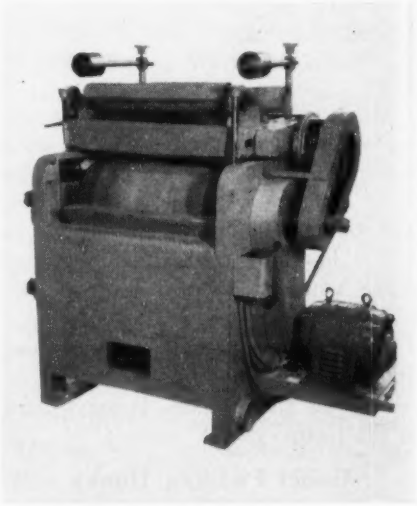
The Udylite Price Guide has become an important tool for thousands of electroplaters. If you are not receiving your copy now, send us your name and address and it will soon reach your desk on the first of each month.

THE Udylite CORPORATION
DETROIT 11, MICHIGAN

WORLD'S LARGEST PLATING SUPPLIER

Automatic Feed Polishing Machine

Timesavers, Inc., Dept. MF, P. O. Box L, Minneapolis 22, Min.



The Smooth-O-Matic, a new automatic feed machine for polishing and deburring metal, is claimed by the above manufacturer to be the only self-feed low cost machine available to the metalworking industry that produces desired results while greatly reducing production time. Equipped with an automatic feed, it can handle all types of flat stock and metal sheets, single plane curved metal surfaces and modified shaped and tapered metal pieces.

The work is fed over the abrasive belt at a high rate of speed with even pressure producing better finishing and deburring than ever before possible for dollars invested in equipment and man-power.

Plastic Lining

Kaykor Industries, Inc., Dept. MF, Yardville, N. J.

A new material which makes possible the lining of large tanks, vessels, and other equipment with unplasticized polyvinyl chloride is called Vyflex FL-85. The new lining is a special continuous laminate of unplasticized polyvinyl chloride on one face and plasticized polyvinyl chloride on the other. Thus the desirable strength and corrosion resistance of the unplasticized material is combined with the flexibility and ability of plasticized polyvinyl chloride to be bonded to steel, concrete, or wood, according to the company. The laminate, which does not require curing, can be installed quickly in equipment large and small by qualified applicators located

throughout the United States and Canada.

In use, the material resists an extremely broad group of oxidizing and non-oxidizing acids, concentrated alkalis, salts, and many corrosive organic compounds. Since the exposed face contains no plasticizers or modifiers there's no danger of contamination of the process reagents.

Among the other advantages over conventional linings, are the maximum operating temperature of 200°F., the increased hardness and abrasion resistance. The wear properties are such that masonry sheathing, when used for mechanical protection, can often be eliminated.

Complete information on the new lining material is provided in Bulletin FL-85, available on request to the above address.

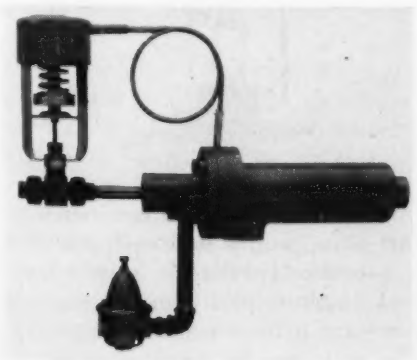
Steam and Water Mixer

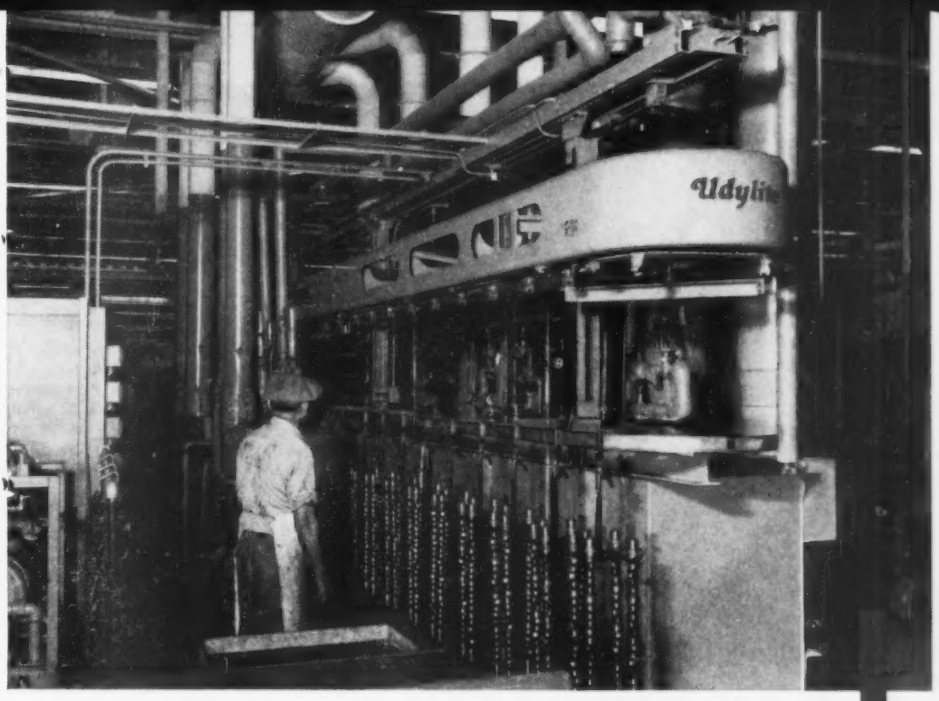
Fulton Sylphon Div., Robertshaw-Fulton Controls Co., Dept. MF, Box 400, Knoxville, Tenn.

A new steam and water mixer, which utilizes full heat energy by injecting steam directly into the water, and is called the No. 1360 series, may be used wherever hot water is required, and steam and water are available. It has a wide range of adaptability in industrial plants for processes of various kinds.

The new control may be employed in industrial plants for supplying hot or warm water to wash stands and gang showers. Safety feature on the new control will shut down the mixer in the event of failure of the water supply. Operation is automatically resumed when the interference is corrected.

The new and unique sensing bulb design has twice the surface area of conventional bulbs. The turbulent blending action occurring on the interior of the annular designed bulb produces instantaneous response of the powerful thermostatic assembly and





ASK THE COMPANY WHO OWNS THEM

New Packard Plant Uses Three Udylite Plating Machines in Modern, Efficient Manufacturing Lines

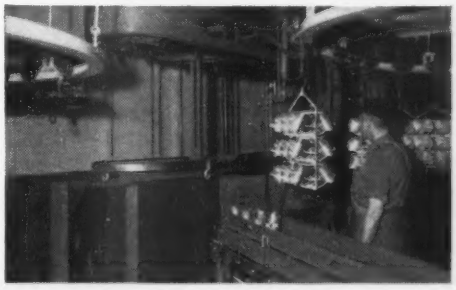
At the Packard Motor Car Company's new, modern Utica, Michigan plant, three Udylite Junior Full Automatic metal finishing machines are processing parts on three feeder lines that deliver components to the final assembly line. The machines are placed right in the flow of work without the necessity of a special plating room.

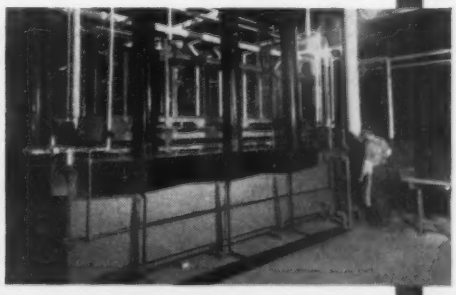
These Udylite machines are used for Lubrite of camshafts (above); tin plating pistons (lower left); and anodizing of miscellaneus parts (lower right).

The Udylite Junior Full Automatic is ideal for any production line. There is no need of moving parts from a line to a remote plating department and then back to the line.

The Udylite Junior will give you high production capacity with a minimum of floor space. It's portable—easily moved when you change your plant layout. But best of all, its cost is low.

A Udylite Junior Full Automatic may be the answer to your factory automation problem. Let us tell you more about it.





WORLD'S LARGEST PLATING SUPPLIER

THE Udylite CORPORATION
DETROIT 11, MICHIGAN

Edmont Case No. 329: Cleaning and acid-etching fabricated cab sections for cranes and shovels, prior to painting. A hazardous operation with ordinary unlined gloves because of the sharp metal edges. Edmont No. 922 gauntlets have been safely used for years. Their NEOX (reinforced neoprene) coating resists cutting and snagging as well as the acid; their soft flannel lining prevents skin irritations. For further economy, right and left hand gloves are individually replaced as they become worn out.

On big power shovels...

Preparing metal for paint is no problem, with job-fitted gloves

If you bought a big power shovel or mobile crane, to work outdoors in every kind of weather, you'd want it to have one of the best protective paint jobs money could buy.

To provide that kind of paint job on its famous "Lorain" cranes and shovels, The Thew Shovel Company pretreats its fabricated sections with acid, which insures a strong bond for the paint.

The problem of handling the sharp-edged sheets and plates in the acid, 8 hours a day, without hand injuries or skin irritations, is no problem at all. For years, Thew's safety-and-cost-conscious management has standarized on *job-fitted* Edmont gloves. The glove used on this operation is coated with cut-resistant, acid-proof NEOX. It has a good grip, is flexible and comfortable to wear. As always, this job-fitted glove has minimized costs through longer wear, better work handling, greater safety and resulting employee satisfaction.

NEOX, natural rubber and plastic coatings — Over-all coated or palm coated—34 types

Free Test Offer: We are interested in helping you fit the correct gloves to your jobs. Send a brief description, on your business letterhead, of your operation, materials handled and temperature conditions. Without cost we will recommend and forward samples of gloves, for job-testing. Our laboratory also develops special gloves for conditions which our 34 standard types do not meet. Address

Edmont Manufacturing Company, 1276 Walnut Street, Coshocton, Ohio

World's largest maker of coated industrial gloves, available through all leading industrial suppliers.

Edmont job-fitted gloves

insures steady, accurate control of water temperature at the desired point, according to company engineers.

The mixing chamber of the No. 1360 is designed to prevent stratification and false temperature indications. The inherent noise accompanying direct injection of live steam into water is held to an acceptable level by the infinitely variable orifice feature of the steam injection nozzle.

The control, available in five convenient temperature ranges, is 15 per cent lower in cost than previous models offered by the company.

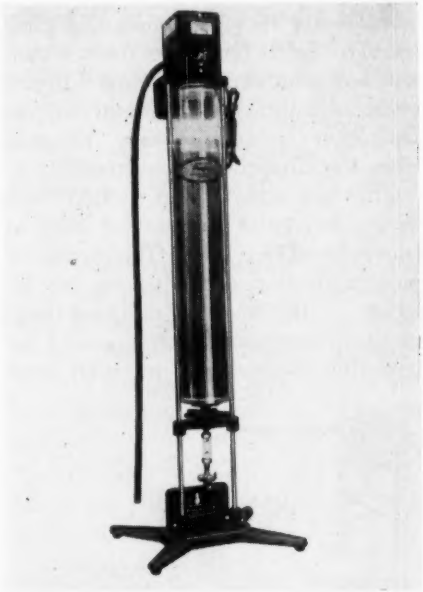
Dual-Type Demineralizer

Penfield Mfg. Co., Inc., Dept. MF, 19 High School Ave., Meriden, Conn.

A dual-type demineralizing unit, designated as Model R-M-8, just announced, is a mono-column type which can be used with a single bed of mixed cation and anion resins, or as a two bed system with separate cation and anion resin beds in the single column.

With either system, the unit produces up to 10 g.p.h. of demineralized water with as little as 10 grains sodium chloride (expressed as $CaCO_3$). If desired, the unit is capable of removing silica and CO_2 as well, through the use of special resins. Regeneration is simple and fast with costs of regenerant chemicals only about 10c.

The unit is a self-contained, completely packaged one which is ready



for immediate use upon connection to raw water source. It is equipped with a precision-type needle valve, drain cock, built-in purity meter, and all necessary influent and effluent piping. The unit may be mounted easily on

a wall. Where preferred, a small counter stand is available for bench use (see illustration).

Automatic Reset Thermopilot Relay

General Controls Co., Dept. MF, Glendale, Calif.

A-100R RELAY

A thermopilot relay for automatic safety shutoff of gas-fired appliances is claimed to offer the ultimate in convenience.

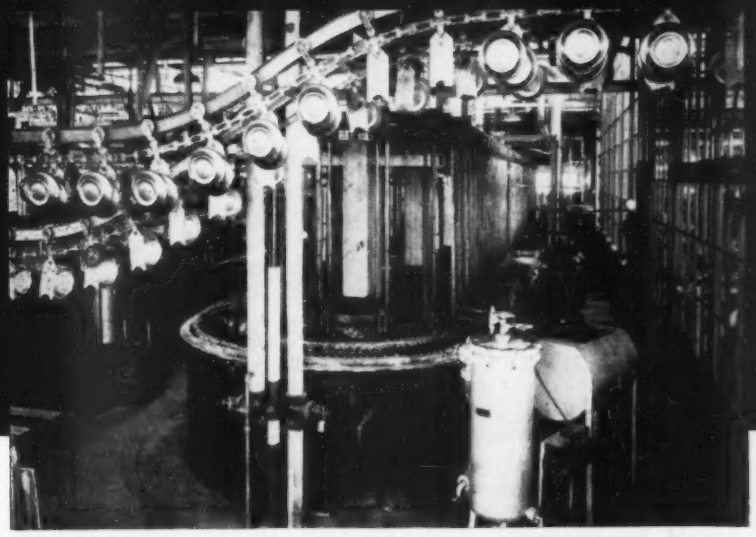
The new unit, known as the A-100R, features automatic reset and exceedingly stable operation. Any tendency to chatter because of vibration is eliminated by the use of the company's powerful G-250 pilot generator, which supplies 10 times the voltage of ordinary single thermocouples of the same physical size.

The current generated by the pilot generator closes the electrical relay switch. When the pilot flame is extinguished, or an unsafe low pilot condition exists, the relay breaks contact to shut off the main control valve. When the pilot flame is relighted, or unsafe condition corrected, relay contact is automatic. No manual reset is required. A slight variation in the pilot flame does not result in a false drop out.

These AGA and UL approved relays are available with either two-wire or three-wire connections. The two-wire design, with relay "normally open," is used for pilot flame safety on furnaces, ovens, boilers, and similar gas-fired equipment. The three-wire units, with their single-pole, double-throw action, can be used in alarm circuits and in electric ignition circuits.

These ruggedly constructed relays

MEAKER
ENGINEERED
Plating Equipment



DESIGNED FOR HIGHEST EFFICIENCY in YOUR PARTICULAR OPERATION

MEAKER puts engineered efficiency into its line of plating, anodizing, phosphatizing, and other processing equipment. MEAKER engineers will help you determine what specific kind of equipment you need . . . and then see that you get it! Whether you need standard or special, fully automatic or batch type, straight-away or return style, through MEAKER'S recommendations you can be *sure* of getting the ideal installation for your particular process. Many years of experience designing and constructing plating equipment for some of the nation's top industrials has given us the technical ability that assures you the utmost in efficiency—high production plating at low unit cost.

Call or write today and have a MEAKER representative survey your problem with you at no obligation. You may be pleasantly surprised at the results.

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STOP LOSSES CAUSED BY OVER & UNDER HEATED PLATING SOLUTIONS

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For All Metal Finishing Processes

for Nickel Plating tanks and other Metal Finishing Processes. It quickly pays back its cost by accurately holding solutions at a constant uniform temperature.

POWERS

2

TECHNICAL DATA SHEET

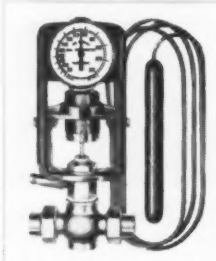
NICKEL

If you plate — NICKEL
Too high a temperature can result in:

1. High consumption of organic addition agents
2. Rapid accumulation of organic decomposition products
3. Dull plate
4. Peeled deposits
5. Excessive evaporation

Too low a temperature can result in:

1. Dull plate
2. Low limiting current density
3. Peeled deposits
4. Poor throwing power
5. Burnt deposits
6. Anode polarization



POWERS No. 11MF Self-Operating TEMPERATURE INDICATING REGULATOR

SEND THIS COUPON NOW for full information

(b94P)

THE POWERS REGULATOR COMPANY
3400 Oakton Street, Skokie, Illinois
☐ Please send Bulletin 330 and Prices on Powers No. 11-MF Temperature Regulator for_____
(Print name of process or type of plating)
☐ Send Bulletin and Prices on Temperature Control for:
☐ Heat Exchangers ☐ Washers ☐ Degreasers
Name_____ Title_____
Company_____
Address_____

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SKOKIE, ILLINOIS • OFFICES IN CHIEF CITIES IN U.S.A. AND CANADA • SEE YOUR PHONE BOOK

are available with a black crackle finished case with screw terminals, or with Douglas or arcless type terminals. The operating mechanism is enclosed in a transparent, dust-sealed case.

The terminals are marked for easy installation, and the unit will operate in any position.

Cast Iron Industrial Fans

Westinghouse Sturtevant Division, Dept. MF, 200 Readville St., Hyde Park, Boston 36, Mass.

Completely redesigned to provide greater versatility and efficiency, this line of cast iron fans will handle powders, dust, gases and fumes.

For specific applications, any of four different wheels or three drive arrangements may be selected. Protective accessories and coatings are available for high temperature and extreme abrasion installations.

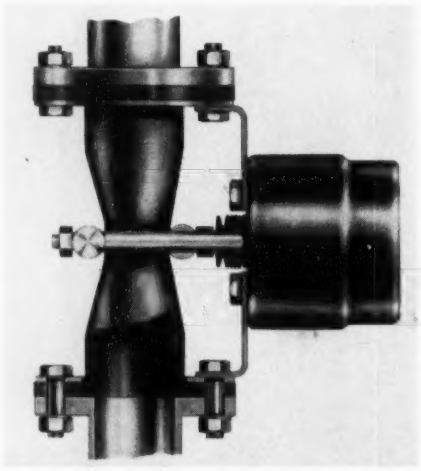
This redesigned 500 series of fans features a wide range of sizes with wheel diameters from 8¼ to 34½ inches and inlet pipe sizes from 4½ to 18 inches. Air volumes range from 150 to 12,000 cubic feet per minute.

Fan housings are convertible to all normal discharge directions and are also reversible. Large heavy duty shafts with grease lubricated double row ball bearings provide long fan life with minimum maintenance. Bearings are triple sealed against penetration by powdered material handled by the fans.

Special fabricated wheels can be made from Everdur or stainless steel and wheels are available in either cast iron or bronze.

Pinch Type Valves for Automatic Control

R. K. L. Valve & Mfg. Co., Dept. MF, 1623 Elaine St., Philadelphia 19, Pa.



A new line of flanged valves, for handling corrosive materials or abrasive slurries, wet or dry, is of the straight-through flow pinch type, consisting of a flanged rubber body and self-supported air-operated pinching mechanism.

The Series Rx (high pressures) and Rz (low pressures) valves give bubble tight shut-off and may be had either with positioner for flow control, or without positioner for on-off service. The rolling diaphragm type air motor is rated for 125 p.s.i. air operation. Valve sizes from ¼" through 14" for a maximum of 100 p.s.i. line pressure and a maximum of 180°F. operating temperature. Other RKL valves are available for hand operation.

Corrosion Inhibitors

John B. Moore Corp., Dept. MF, P. O. Box No. 3, Nutley 10, N. J.

Princeton Paint Labs. have assigned to the above company marketing and manufacturing rights to two new types of corrosion inhibitors, effective on both ferrous and non-ferrous metals.

"CI-103" is a film-former which dries tack-free in three to four minutes and may be removed easily by simple aromatic petroleum solvent wash.

"CI-104" is neither a coating nor a film-former, but leaves an extraordinarily durable deposit of monomolecular dimension as a moisture barrier on surfaces treated.

Pencil Test for "Free" Cyanide

Pollack Products Co., Dept. MF, 1628 East 7th St., Brooklyn 30, N. Y.

A special alloy pencil for testing and determining the approximate "free" cyanide concentration permits a test to be made in seconds on plain cyanide-copper, rochelle-copper and all high speed copper plating solutions. A simple dip of the pencil tip in the solution for about 15 seconds will quickly indicate whether the "free" cyanide is too high, low or in the safe working range.

Regular use of the "Free" Cyanide Pencil by the plater at the tanks will help keep copper plating solutions in balance and operating at peak load and effiiciency. The pencil will indicate in which direction small additions of either copper salts or cyanide should be made.

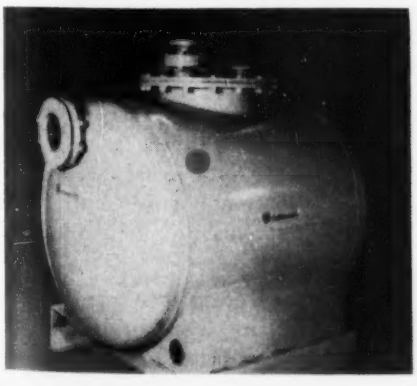
Since the cost is low every tank operator can use it regularly and quickly to keep solution in constant balance. Several hundred tests can be made with one pencil. The pencil is supplied in a convenient carrying case.

Portable Tanks

Heil Process Equip. Corp., Dept. MF, 12901 Elmwood, Cleveland 11, O.

This type of portable storage-transfer tank is paying off in many industries as an efficient, economical substitute for expensive pipe-valve-pump systems. It is particularly adaptable where there are varying and intermittent requirements for heavy acids or industrial chemicals in different plant areas.

Progressive project engineers have found these units efficient as transfer tanks eliminating dangerous and cumbersome carboy handling. They have also been found useful as temporary storage units during repair or clean-out of permanent storage equipment.



These portable tanks are available with a variety of sheet linings or coatings for complete protection against a wide range of corrosive elements. Engineers of the above company have developed designs for capacities from 200 gallons upward on either skids or casters.

Centrifugal Pumps

F. E. Myers & Bro. Co., Dept. MF, 937 So. Orange St., Ashland, O.

Three new sizes have been added to the manufacturer's Centri-Thrift line of centrifugal pumps.

New to the low-priced liquid transfer pump line are one and a half, two and three horsepower sizes. Previous models included 1/3, 1/2, 3/4 and one horsepower sizes. The complete line now offers pumps which will develop heads up to 135 feet and capacities up to 90 gallons a minute. The pumps are available in motor-mounted or belt-driven models.

Hard Water Bypass for Zeolite Softeners

Graver Water Conditioning Co., Dept. MF, 216 W. 14th St., New York 11, N. Y.

At times, it is necessary to treat water to produce a controlled degree of hardness rather than complete softness. For this need, a new zeolite bypass controls the proportionate mixing of untreated hard water and treated, fully-softened water to produce whatever degree of hardness is desired.

Operation is extremely simple. Only a single setting (on the adjustable ori-

When you think of finishing & deburring

think of Hammond

The experience gained in over 70 years of machinery building has provided us with a bank of "Know-How."

Hundreds of manufacturers have found more efficient means of parts finishing by drawing on our bank of "Know-How." The Hammond "family" of Automatic Deburring and Finishing Machines covers a wide range of types and sizes.

Our business is to share this knowledge with you, in order to bring down high deburring and finishing costs. We would like to help you, too.

Hammond Machinery Builders Inc.
1601 DOUGLAS AVENUE • KALAMAZOO, MICHIGAN

Entirely New Filter Design!

Sel-Rex DOUBLE DUTY FILTER

DOUBLE VOLUME New Sel-Rex Annular Type principle doubles filtration area and volume without increasing size of unit.

DUAL PURPOSE Efficient low-cost operation with either cloth bag or porous stone.

EASY OPERATION and MAINTENANCE

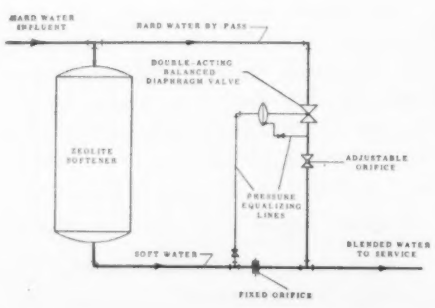
- Entire filter element secured to tank cover . . . simple inspection and cleaning.
- Extra capacity precoat tank.
- Colored operating valves located at front of unit permits operation by unskilled help.
- Horizontal hose connections eliminates danger of leaks and ruptures.
- T-valve permits clean changeover from precoat to filtering.

Sel-Rex Filters available in standard sizes (Portable or Stationary models) 175 sq. ft. area. Larger units designed to specifications.

BART-MESSING CORPORATION

Dept. MF-4, 229 Main Street Belleville 9, N. J.

fice) need be made to regulate the ratio of hard water to soft. Valves are automatic and adjust rapidly and surely to flow variations of one to four, without any perceptible loss of accuracy. There are no pumps and there is a minimum number of moving parts.



This simplicity keeps costs down for installation ,operation and maintenance and assures a maximum of dependability. Also, bypassing the zeolite softener extends softening cycles and produces savings in operation and resin costs.

BUSINESS ITEMS

Wagner Brothers Makes New Appointment to Detroit Sales Staff

Fred W. Wagner, sales manager, *Wagner Brothers, Inc.*, has appointed *Thomas Kohler* as sales and service representative for the Detroit, Michigan area.

Thomas Kohler

Kohler was formerly manager of the company's Filter Division, supervising all engineering and manufacturing for their complete line of permanent membrane type liquid filters. Prior to that, he had widely diversified experience in the electroplating field, serving as plating superintendent for several manufacturing concerns. He is a graduate of St. Lawrence University, Canton, N. Y.

Almco Supersheen Contest

The *Almco Supersheen Division* of *Queen Stove Works, Inc.*, Albert Lea, Minn. has announced a contest open to users of their barrel finishing processes. Two divisions have been established with first and second place awards and 6 honorable mention citations for each. The first division award will be for contestants presenting case history evidence of the largest *total dollar* saving from finishing a part by the company's process and the second division award will be for the greatest *percentage* of saving.

These awards are for amounts up to $250 and entry forms are available from the company.

National Lead Co. Appoints Putney

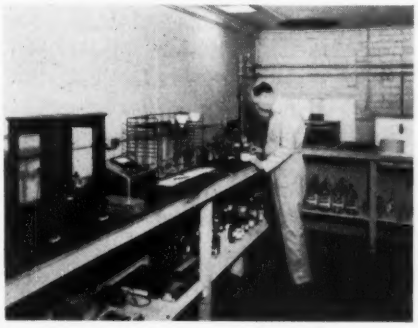
Robert A. Putney has been appointed assistant to the manager of *National Lead Co.'s* metal department, according to an announcement by *William J. Welch*, vice-president and metal department manager.

Mr. Putney began his company career in 1930 in the general office accounting department. In 1935 he be-

came assistant to the manager of the Atlantic branch metal division. He was transferred to the Boston branch in 1940, where he assisted in the reorganization of the metal department. Mr. Putney went to Perth Amboy in 1944 as purchasing agent for secondary metals and drosses, continuing as assistant to the Atlantic branch metal division manager. In 1949 he was appointed superintendent of the smelting and refining department at Perth Amboy and in 1951 he became plant manager, continuing in that position until the present appointment.

Vea Chemcial Co. Opens New Lab

Vea Chemical Co., manufacturing chemists, announce the opening of a new laboratory in their plant at 1217 Main Ave., Cleveland, Ohio. The completely modern equipment and facilities will be used to further research and development of B.P.R. electroless



nickel. Their catalog, revised to cover the recent innovations in their process, may be had on request, and the services of their laboratory are offered without charge in processing experimental and sample parts as submitted.

Dale G. Weber Co. Appointed International Rectifier Distributor

International Rectifier Corp. of El Segundo, Calif., has announced the appointment of the *Dale G. Weber Co.*, 234 Sherlock Bldg., Portland, Ore., as their industrial and jobber representative in the States of Washington, Oregon, Montana and Idaho, as well as the territory of Alaska.

Dale G. Weber, head of the firm, is well known to the industrial and jobber firms in this territory and will assist with information and service for International's selenium rectifier products.

Wagner Brothers Adds to Michigan Sales Staff

Fred Wagner, sales manager, *Wagner Brothers, Inc.*, announces the recent appointment of *Jim Lekander* as salesman and service representative for the southern Michigan industrial area, including Toledo, Ohio.

Jim Lekander

Mr. Lekander was formerly plating foreman and chemist with Industrial Stamping and Mfg. Co. His background includes a widely diversified experience in the production and technical supervision of electroplating processes. He is an alumnus of Michigan College of Mining and Technology and of Lawrence Institute of Technology.

New Pump Distributor

The appointment of *The Hays Supply Co.* of Memphis, Tenn. as a distributor for Ampco centrifugal pumps

FORMAX

the Perfect Combination

FROM START TO FINISH

ZIPPO CLOTH BUFFS

These famous long-wearing buffs run cool under all buffing conditions. High count bias-cut cloth is assembled on ventilated steel centers. Each section is perfectly balanced and faced—requires no raking.

BUFFING COMPOUNDS

Formax produces a complete line of buffing compounds in bar, tube and liquid form.

Our extensive manufacturing, laboratory and testing facilities are at your disposal.

ZIPPO SISAL BUFFS

You have a pleasant surprise coming if you haven't tried the new Zippo bias-type sisal buff. It was specifically developed for steel buffing—to blend polishing grit lines—to cut down stainless steel—and bring up a bright lustre.

Other Formax products include the well-known C-20 Flexible Contact Wheels and F-26 Abrasive Belt Grease Stick.

Descriptive Catalogs Sent on Request

FORMAX MFG. CORP.

DETROIT 7, MICHIGAN

"THE FOUR McALEERS"

Du-Lite
FINISHED

The Marlin Firearms Co., "Famous for Fine Guns since 1870", has long depended on Du-Lite black oxide for an attractive finish that will be dimensionally stable throughout the life of the gun.

The Du-Lite process provides intricate precision parts with a durable, rust-resistant black oxide finish. And since Du-Lite penetrates the metal, all crevices and knurls are protected without affecting dimensions or fit.

If your target is durable, attractive, economical finishing, you'll want to know more about Du-Lite black oxide.

Whatever your cleaning or finishing problem—**Depend on Du-Lite.**

Write for complete information.

DU-LITE CHEMICAL CORP.
MIDDLETOWN, CONN.
Send more information on Du-Lite..... ☐
Send information on metal finishing products.. ☐
Have your representative call..... ☐
Name.....
Company.....
Address.....
City..... Zone..... State.....

Du-Lite
METAL FINISHING SPECIALISTS

has been announced by the Pump Division of *Ampco Metal, Inc.*, Milwaukee, Wis.

The complete line of pumps will be offered by Hays in the Memphis trading area. The pumps are built to various sizes in 3500 RPM and the new versatile 1750 RPM to handle essentially corrosive and erosive liquids.

Pfizer Names New West Coast Chemical Sales Representative

Reginald Robinson has been assigned to represent the chemical sales division of *Chas. Pfizer & Co., Inc.*, in the San Francisco area, *Frank F. Black*, sales manager, announced recently.

Mr. Robinson succeeds *Edward A. Poleselli*, who is being transferred to the headquarters of the Pfizer International Subsidiaries. New York.

A resident of El Cerrito, Calif., Mr. Robinson has been with the University of Calif. Radiation Laboratory. He was previously associated with the Union of Richfield Oil company in an engineering capacity.

He was graduated from Princeton University in 1945 with a degree in Chemical engineering.

Changes at Diamond Alkali

C. E. Lyon, vice president and general manager of *Diamond Alkali Co.'s* Chlorinated Products Division since January, 1954, will retire May 1. Appointed to succeed him as general manager of this division is *Loren P. Scoville*, director of engineering for the past 10 months. Scoville's successor, in turn, is *C. C. Brumbaugh* who, since September 1954, has held the position of director of research — atomic energy, alkali and electrolytic products.

Mr. Scoville takes over his new assignment with a background of nearly a quarter-century's experience in chemical process engineering and management. He joined the company last March as director of engineering following 10 years with Jefferson Chemical Co., New York, where he last served as vice president in charge of engineering, purchasing and operations.

Previously, Mr. Scoville had been associated with the Southwestern Engineering Co., New York, where his engineering responsibilities eventually included process design, economic studies and project engineering on many large petroleum refining installations. He holds degrees in chemncal engineering from the University of Redlands, Cal., and California Institute of Technology, Pasadena.

Mr. Brumbaugh has been associated with the company for the past 18 years. He has played an important role during this period in furthering the firm's intensive research and development program.

A graduate of Carnegie Institute of Technology, Pittsburgh, Mr. Brumbaugh joined the organization in 1937 and was promoted to chief engineer of its Painesville (O.) Plant in 1947. The following year he was named director of research and development, a post he held until September, 1954, when he assumed the duties he now relinquishes in becoming director of engineering.

New Pacific Coast Manager For Federated Metals Division

E. L. Newhouse, Jr., vice president of the *American Smelting and Refining Co.*, has announced that, effective May 7, 1955, *Leo Halpern* is resigning as Pacific Coast manager of the Federated Metals Division. Mr. Halpern will be replaced by *Frederick Farnow*, who is at present manager of the San Francisco plant of the division.

Dalton Elected At Chicago Wheel and Manufacturing Co.

Chicago Wheel and Mfg. Co., a sixty-year old Chicago firm manufacturing industrial abrasive products, announces the election of *Arthur T. Dalton*, vice-president in charge of sales. Associated with the firm for 30 years, he was formerly secretary and sales manager.

Electroplating Lab. Presented to Illinois Institute of Technology

The first electroplating laboratory to be set up specifically for educational purposes was dedicated during an "open house" program Feb. 23 at *Illinois Institute of Technology*, Chicago.

Modern laboratory equipment has been presented to Illinois Tech. by the *Chicago Electroplaters Institute*, an organization of electroplating manufacturing firms in the Chicago area, in collaboration with the Chicago Branch of *American Electroplaters' Society* and suppliers to the industry.

Other schools offer electroplating courses, but IIT will be the first institution to provide laboratory facilities to supplement theoretical training.

Appearing on the program was *Dr. John T. Rettaliata*, IIT president; *Ro-*

bert L. Geisel, chairman of the Chicago Electroplaters Institute, and *Joseph Andrus*, IIT evening instructor of electroplating, representing the Chicago Branch of the AES. *Dr. Ralph G. Owens*, dean of engineering at Illinois Tech, was program chairman.

The laboratory was established at Illinois Tech to provide more adequate training in the field of electroplating, thus improving the facilities of the school and insuring the industry of well-trained personnel.

Illinois Tech currently is offering an evening course in electroplating, and the installation of laboratory equipment will enable it to enlarge its courses both at the day and evening level.

Geisel spearheaded the Chicago Electroplaters Institute drive for funds to finance the installation of the laboratory. Laboratory requirements were outlined and the equipment installed under the direction of Andrus.

Organizations that contributed a full share of $700 toward the laboratory include: *American Electroplaters' Society*, Chicago Branch; *Belke Mfg. Co.; Chicago Electroplaters' Institute; Crown Rheostat & Supply Co.; Kocour Co.; Charles F. L'Hommedieu & Sons Co.; George A. Stutz Mfg. Co.*, all of Chicago.

Also: *G. S. Blakeslee & Co.* and the *Meaker Co.*, both of Cicero, Ill.; *Hanson-Van Winkle-Munning Co.*, Matawan, N. J., and the *Udylite Corp.*, Detroit, Mich.

Contributions of less than $700 were made by the following: *Carpart Corp.*, Owosso, Mich.; *C. P. Hall Co.* of Illinois, *Joy Mfg. Co., Manderscheid Co.*, and *Wagner Brothers, Inc.*, all of Chicago.

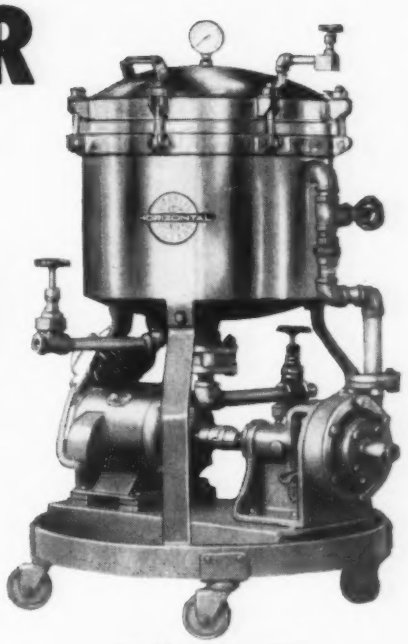
A plaque inscribed with the names of the major donors will be placed in the new laboratory.

General Controls Co. Announces Changes

In order to insure more effective servicing of the Southeastern United States, *General Controls Co.* of Glendale, Calif., has moved its regional sales office and warehouse from Birmingham, Ala., to Atlanta, Ga. The announcement was made by *J. F. Ray*, vice president in charge of sales. Address of the new facility is 1479 Spring St., N.W.

George Deyo is the regional manager in charge of the Atlanta headquarters for the company, which is one

SPARKLER
HORIZONTAL PLATE
FILTERS



Sparkler Plating Filter
Model 18-D-6 Alliron
600 G.P.H. Portable

FOR LOW COST FILTERING OF PLATING SOLUTIONS AND CARBON TREATMENT WITHOUT SHUT DOWN

HERE'S HOW

On a horizontal filter plate it is possible to apply a thin pre-coat with about one-third the filter aid, and in one-third the time required for pre-coating a non rigid media or a surface in a vertical position. This saves time and filter aid.

Where several tanks are to be filtered, the Sparkler filter can be shut down after filtering the first tank and moved to the next one without danger of disturbing the filter cake. This saves pre-coating time and filter aid usually required to re-coat a bag-type filter.

A filter cake on a horizontal plate will not crack, slip or fall off even with varying pressure or a complete shut-down of the filter. No pre-coat renewal is ever required after an interruption in operation.

When it is necessary to clean the filter, the Sparkler filter tank can be emptied in a matter of minutes with a minimum loss of valuable plating solution.

Any grade of filter paper from fine to coarse can be used in a Sparkler filter. This makes it ideal for carbon treatment of solutions. Carbon mixed with water in a stand-by tank is circulated through a clean set of filter paper on the plates until a carbon cake is formed. The solution requiring carbon treatment is then circulated through the carbon beds without contaminating the plating tank or a shutdown of plating operations.

At the end of the cycle with a Sparkler filter you can blow-down with air and produce a relatively dry cake that can be disposed of in a trash can rather than washing it down the drain with attendant sewer clogging problems.

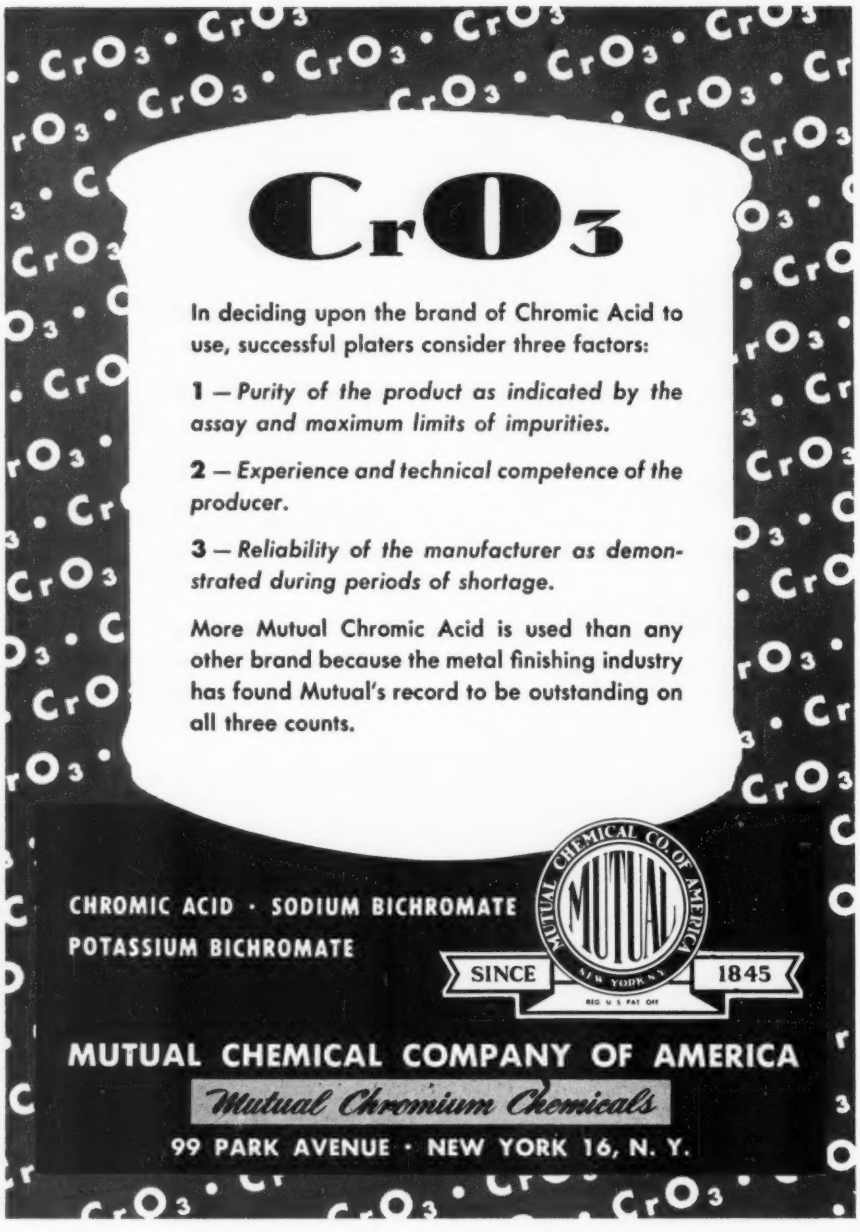
You will find your Sparkler plating filter positive and dependable from a standpoint of uniform high quality filtering and economical in labor and material.

Write Mr. Eric Anderson for personal service.

SPARKLER

Sparkler representatives in all principal cities are ready to give you personal service on your filtering problems, and show how you can make a material saving in operating cost.

MANUFACTURING COMPANY
Mundelein, Illinois
SPARKLER INTERNATIONAL LTD.
Canadian Plant, Galt, Ontario
European Plant, Amsterdam, Holland


CrO3
In deciding upon the brand of Chromic Acid to use, successful platers consider three factors:
1 — Purity of the product as indicated by the assay and maximum limits of impurities.
2 — Experience and technical competence of the producer.
3 — Reliability of the manufacturer as demonstrated during periods of shortage.
More Mutual Chromic Acid is used than any other brand because the metal finishing industry has found Mutual's record to be outstanding on all three counts.
CHROMIC ACID · SODIUM BICHROMATE
POTASSIUM BICHROMATE
MUTUAL CHEMICAL CO. OF AMERICA
MUTUAL
NEW YORK N.Y.
SINCE 1845
MUTUAL CHEMICAL COMPANY OF AMERICA
Mutual Chromium Chemicals
99 PARK AVENUE · NEW YORK 16, N. Y.

of the nation's leading manufacturers of automatic pressure, temperature, level and flow controls.

Change In Name of Honan-Crane Corp.

Effective March 1st, the name of *Honan-Crane Corp.*, Lebanon, Ind. was changed to *Houdaille-Hershey of Indiana, Inc.* Announcement of the change comes from the parent company, *Houdaille-Hershey Corp.*, Detroit, Mich.

Honan-Crane has been operated as a subsidiary of Houdaille-Hershey for the past ten years and is one of the pioneers in the oil and coolant filtration fields. The name "Honan-Crane" will be retained to identify the new company's oil filter equipment.

In addition to Houdaille-Hershey of Indiana, the organization operates seven plants in the United States and Canada supplying many products to the automotive, aircraft, refrigeration, railroad and agricultural industries.

Fielden Instrument Names Sales Rep. for Northern Ohio and Northwest Pa.

Appointment of *A. W. Roat* as field sales representative of *Fielden Instrument Division* of *Robertshaw-Fulton Controls Co.* was announced by *Ralph M. Stotsenburg*, division sales manager. The division is a producer of electronic controllers and industrial instrumentation.

Mr. Roat will cover the northern half of Ohio and several counties in northwest Pennsylvania. He will operate from the division's Cleveland sales office, located at 3091 Mayfield Road, Cleveland Heights.

Rotner Joins Pall Filtration

The *Pall Filtration Companies*, Glen Cove, N. Y., announce the appointment of *Evan R. Rotner* to their research and development staff. Mr. Rotner was formerly with the Stauffer Chemical Co. at its carbon disulphide research center at Chauncey, N. Y. The Pall Filtration Companies are comprised of the *Micro Metallic Corp.*, *Aircraft Porous Media, Inc.*, and the *Porous Plastic Filter Co.*

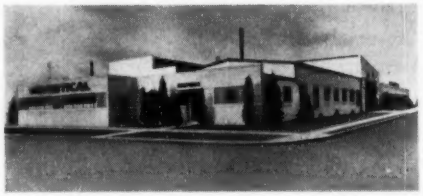
A resident of Yonkers, N. Y., Mr. Rotner graduated from New York University in 1951 with a degree in chemistry. Prior to his association with Stauffer, he served as ballistic meteorologist and anti-aircraft radar specialist for the U. S. Army.

New Technical Service Group

R. E. TenHoor has been appointed supervisor of a new section, designated as the industrial chemicals section of *The Dow Chemical Co.* This group will provide technical service for a large number of organic and inorganic products. It was established to provide increased service for customers using such products.

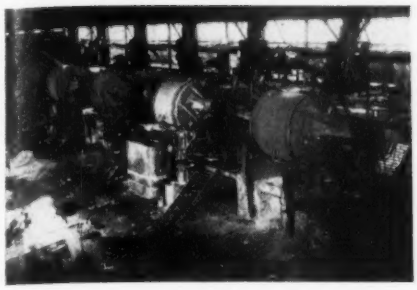
TenHoor received a B.S. degree in industrial chemistry from the University of Michigan in 1947 and three years later joined Dow's organic chemical sales staff. He transferred to Technical Service and Development in 1953. His activities have related to phenolic materials and resins and his most recent assignment was on resin intermediates in the development unit of Technical Service and Development.

Univertical Installs New Furnaces



Univertical Foundry & Machine Co., 14841 Meyers Road, Detroit 27 Mich., has just ocmpleted the installation of five one ton capacity Detroit Rocking Electric Furnaces for casting and recasting of nickel anodes. These furnaces having a potential capacity of 7500 pounds an hour.

Univertical Foundry & Machine Co.



The casting of pure nickel anodes calls for furnaces such as these capable of producing uniform results at high controlled temperatures. Indirect arc heat provides fast, controlled melting of nickel, while holding variation and carbon pickup to a minimum. Constant motion assures homogeneity of the metal.

has been an important manufacturer of anodes for the plating industry since 1939 The new plant embraces 16,000 square feet of manufacturing, engineering and laboratory facilities.

New Brass Mill for American Brass Co.

The American Brass Co. will soon begin construction of a new brass mill in the Paramount district of Los Angeles, California, according to a statement issued by *John A. Coe, Jr.*, company president.

The new mill, according to the statement, will be built for the production of copper and copper-base alloys in the form of sheet, strip, rod, tubing and drawn copper products. Annual capacity is estimated to be about 30,000,000 pounds.

The building will be one-story construction of heavy steel and will be equipped with overhead crane service throughout. The mill and office will require 330,000 square feet of floor space, and, together with the land, will involve an expenditure of $13,000,000.

The Union Pacific Railroad, whose tracks run along the east side of the property, will serve the plant site.

When the new mill is in full operation, it will furnish employment for approximately 500 people. Personnel will be recruited locally.

Turco Appoints Archie K. Beard

Appointment of *Archie K. Beard* as manager of the Metal Processing Division and eastern divisional manager of the new Chem-Mill Division has been announced by Pres. *S. G. Thornbury* of *Turco Products, Inc.*, Los Angeles manufacturer of specialized chemical processing compounds. Mr. Beard will headquarter at the company's eastern plant in Newark, N. J.

Mr. Beard will be in charge of national sales to all heavy industry, other than to transportation accounts. As eastern manager of the Chem-Mill Division, he will introduce the new method of contouring metal by chemical means to industrial firms throughout the eastern United States.

Form New Firm to Manufacture Industrial Work Clothes of Dynel and Dynel Blends

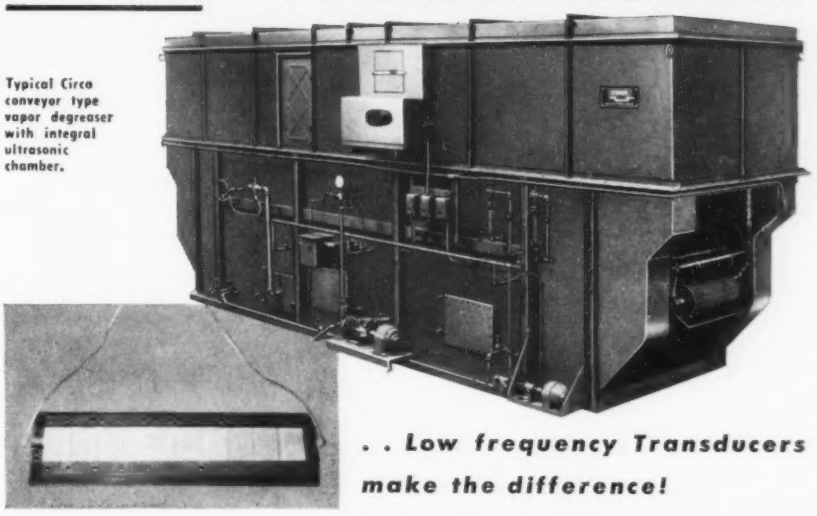
Formation of *Wynko Manufacturing Corp.*, a Tennessee corporation to design, manufacture and sell industrial work clothing of all-Dynel and Dynel-blended fabrics, was announced by *R. J. Kohn, president*, at the new firm's national sales headquarters, *175 Main Street, White Plains, N. Y.*

The firm will utilize the manufacturing facilities of Southern Athletic Co., widely known as one of the nation's largest manufacturers of athletic clothes. *H. D. (Breezy) Wynn*, president of Southern Athletic, is to be treasurer of the new company. Other officers are *Matlock Hays*, vice president, and *L. L. Fisher*, secretary.

Mr. Kohn is widely known as a pioneer in the development of Dynel for industrial clothing. He was formerly part owner and sales manager of *Chem-Wear, Inc.*, Darien, Conn. For the present, the new company will concentrate on chemically resistant work garments made of a new spun-dyed all-Dynel farbic. In the near future, this line will be supplemented by garments of blend fabrics combining Dynel with cotton and other fibers.

Scrubs out the last speck of *DIRT*

CIRCOSONIC ULTRASONIC DEGREASER



Typical Circo conveyor type vapor degreaser with integral ultrasonic chamber.

. . Low frequency Transducers make the difference!

Use Circosonic whenever cleanliness must meet stringent industrial or military standards. New transducer operates at lower frequency which cuts shadow effect so that ultrasonic waves curve around corners . . . remove every last speck of oil, grease, lapping compound and dirt from deepest recesses and capillaries as no other method can do. New shape beams sound energy over wider area . . . requires no critical positioning when cleaning small parts like bearings and electronic components . . . extends to any desired length for large shapes like transmission pumps and gears. Circosonic units provide new standards of cleanliness while cutting cleaning time from hours to *seconds* . . . may also be integrated into existing cleaning equipment.

SINCE 1923

CIRCO EQUIPMENT COMPANY

MANY STANDARD MODELS . . . Units from 500 watts to 25 kw. Available separately or integrated with Circo Vapor Degreasers, conveyorized or hand operated. All backed by nationwide technical field service.

YOUR INQUIRY BRINGS complete ultrasonic technical data . . . plus authoritative 32-page Vapor Degreasing Manual. No obligation, of course.

130 Central Avenue, Clark (Rahway), New Jersey Offices in principal cities

PER-SOLV (Perchlorethylene) CIRCO-SOLV (Trichlorethylene)

Vapor and Ultrasonic Degreasers • Metal Parts Washers • Dryers • Solvent Recovery Stills

Nice Product, Nice Package

Folks often wonder why we spend an extra ¼¢ a pound out of our own pockets for a lithographed drum. Fact is we're proud of the quality of BFC Chromic Acid and figure it deserves a bright, colorful container.

Every batch gets checked against a tough quality spec. Off-grade acid goes on the dump. Only top-quality material goes into those shiny BFC drums. Send us a modest order and see for yourself.

BETTER FINISHES & COATINGS, INC.

268 Doremus Ave., Newark 5, N. J.

122 East 7th St., Los Angeles 14, Calif.

PAINTS · PLASTICS · CHEMICALS BFC

Stanley Chait

company. He is an active member of the *New York Branch* of the AES, and served as Outing Chairman at last year's AES Convention.

Stanley Chait took his Bachelors Degree in science at New York University and obtained his Masters Degree at Columbia University. He has done extension work in the fields of Radar and Navigational aids. Has been associated with various consulting engineering firms and recently with Rapid Electric Co. as design and project engineer. His education, ability and experience combined with his interest in the metal finishing industry has resulted in many new automation developments, one of which is currently under patent application.

Bruno and Chait Form Macarr, Inc.

Philip P. Bruno and *Stanley Chait* have formed *Macarr, Inc.* This company will serve the metal finishing industry by the introduction of many advanced concepts in "Automation." Their principal product is "Automation Engineering" for existing DC Power equipment such as rectifiers and generators.

Philip P. Bruno jointly served the *Western Electric Co.* and *Bell Laboratories* for five years prior to joining the *Rapid Electric Co.* in 1947. With this latter firm he held responsible positions in sales, management and engineering until Jan. 1955 when he resigned to form the newly announced

Philip P. Bruno

R. W. Stephens Joins United Chromium Limited

United Chromium Ltd., Canadian affiliate of *United Chromium, Inc.*, has announced that *R. W. Stephens* has joined them as a sales and service engineer. He will serve the Canadian metal finishing industry with the complete line of Unichrome plating processes, materials, equipment, organic coatings, and Ucilon protective coatings.

Mr. Stephens has long been associated with electroplating. His career started with the Appliance Division of Canadian General Electric Co. in 1935. From 1945 through 1947 he was with Coro of Canada Ltd. He later served several years with Brydon Brass Mfg. Co. in the marine hard-

R. W. Stephens

ware field. Since 1950 Mr. Stephens was a sales and service engineer for F. B. Stevens.

Dr. Donald Price Enters Consulting Field

Dr. Donald Price, widely known authority on surface-active agents, detergents and cleaning materials, and author of the book entitled, "*Detergents, What They Are And What They Do*," has entered the consulting field. Dr. Price, who holds thirty-five U. S. and foreign patents, and is author of more than twenty-five original research and technical papers in the fields of organic chemistry, vitamins, oils and fats and surface-active agents, will specialize in surface-active agents, cleaning materials, the chemistry of oils and fats and research administration.

After receiving his Ph.D. degree at Columbia in 1930, Dr. Price spent two years in research in Europe at the universities of Cambridge and Munich and taught at Columbia for five years.

Among the well known firms with which he has been associated are National Oil Products Co. (now Nopco Chem. Co.), Harrison, N. J., where he was technical director, and Interchemical Corp., New York. Since 1945 he has been technical director of Oakite Products, Inc., nationally known manufacturer of industrial cleaning materials.

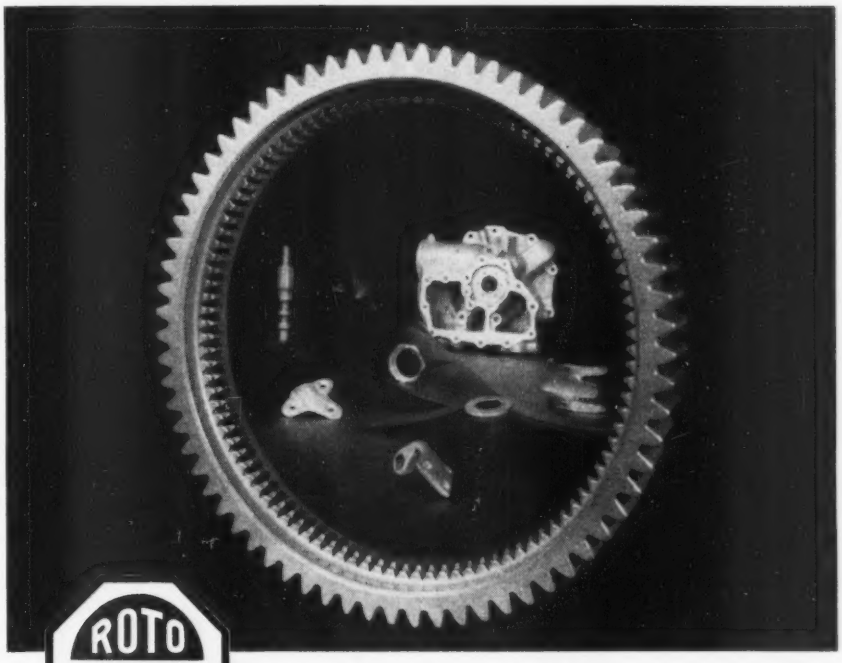
Dr. Price is active in a number of scientific and technical societies and has been a trustee of The Chemists Club and chairman of its Library Committee. From 1951 to 1953 he was chairman of the Research Committee of the American Electroplaters' Society.

Dr. Donald Price

Deming Company Conducts School for Distributors

Recently, 41 distributors from 22 states attended the 39th School of Practical Hydraulics conducted by *The Deming Company*, Salem, Ohio, manufacturer of commercial and industrial pumps.

The school was established in 1944 to train distributors, dealers and sales representatives in the efficient solution of common pump problems. In the modern classroom at the company offices in Salem, students work on actual problems and use actual Deming pumps. Classes include sessions on



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it's the finish that counts!

Roto-Finish maintains exact tolerances on precision parts with no significant dimensional changes. It makes possible a wide range of finishes applicable to parts of almost any size or shape; finishes a variety of materials — at big savings in manpower and costs. Without obligation, send sample unfinished parts to us. Include finished part for guide and your specifications. Roto-Finish will finish parts in its laboratory. You get a complete process report. You are guaranteed results and a finish that counts!

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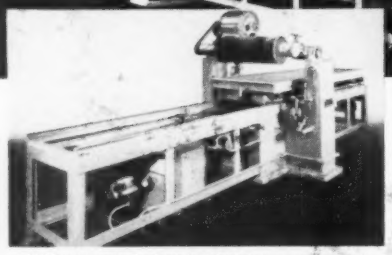
Pay Big Dividends in Time Saved and Improved Quality

TANDEM ROLL HORIZONTAL MACHINE
For cut down and finishing of sheets, plates, extrusions, trim, etc.



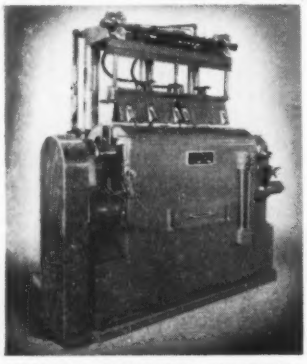
SINGLE ROLL HORIZONTAL MACHINE
Hydraulically operated, with patented hydraulic contour device. Tables on all machines may be oscillated sidewise.

• FASTER
• MORE EFFICIENT
• ECONOMICAL

For cutting costs, improving quality and speeding up your finishing operations on sheets, plates, extrusions, rods, tubing, auto trim and many odd-shaped pieces, Central Polishing Machines will meet every production requirement as they have done so successfully wherever they have been installed.

Horizontal Machines are built in single and tandem roll models, 30", 40" and 50" widths, in any length. Are hydraulically or electro-hydraulically operated from a central operator's station and equipped with our patented hydraulic contour control. Stroke adjusted from 2" to full capacity in stepless increments. Tandem rolls permit cut down and finishing operations with one set-up.

Vertical Machines are available with 18" or 36" stroke. They are fast, economical and easy to operate. Patented hydraulic contour device permits finishing many different shapes such as hardware items, handles, cutlery, auto and appliance trim, escutcheon plates, etc. Central Vertical Machines may be set in batteries where a sequence of operations is desired. Conveyor systems and fixtures can be furnished.



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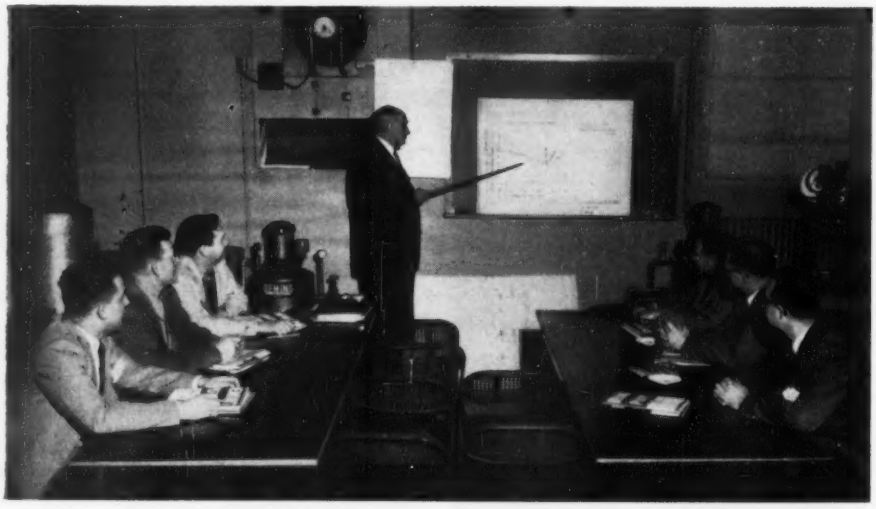

Harry Ewens, Deming Company chief instructor, illustrates his lecture with pump performance curves at a session for mill supply distributors at the Deming School of Practical Hydraulics, Salem, Ohio.

theory, proper pump selection and installation, new products and company policies. Distributors apply their knowledge to the pump problems of their dealers and other customers.

Scheel Heads Up Heil Process Equipment's Chicago Office

Robert Scheel

Heil Process Equipment Corp., Cleveland, have announced the appointment of *Robert Scheel* to head up their Chicago office located at 400 West Madison Ave.

A sales engineer, Scheel is a graduate of Ohio University and formerly was associated with the Elyria, Ohio, plant of Bendix-Westinghouse before joining Heil as an estimator, and later as sales engineer, where he acquired extensive sales and field engineering experience. He is a member of the American Electroplaters' Society and, at his new post, will represent the company's complete line of chemical and corrosion-proof equipment.

American Rectifier Appoints Distributor

American Rectifier Corp. of New York City, manufacturer of selenifiers (rectifier units) for industrial and commercial applications announces the appointment of the *Industrial Sales Division, Lipman Electric Co.* of Baltimore, Md., as regional representatives in the states of Maryland and Delaware.

Seiter Heads New Stokes Vacuum Equipment Division

F. J. Stokes Machine Co., Inc., Philadelphia, has announced the appointments of *J. Gordon Seiter* as manager of its newly established High Vacuum Division.

Mr. Seiter came to Stokes in 1950 to head its vacuum metallizing sales after being general manager of George E. Fredericks Co., Bethayres, Pa., specialists in high vacuum gages, pumps and other scientific instruments. He is a prolific author and has been a frequent speaker on vacuum

J. Gordon Seiter

metallizing before meetings of the *American Electroplaters' Society* and the *Society of Plastics Engineers.*

Wyandotte Holds Annual Sales Conference

The fifty-seventh annual sales conference of *J. B. Ford Division, Wyandotte Chemicals'* district sales managers laid plans for expanded sales and service activity in 1955. A broader product line and a larger service staff will be programmed.

The conference was held at the St. Clair Inn in Michigan and was followed by regional meetings in Philadelphia, St. Louis and San Francisco. These regional meetings were attended by the company's entire North American sales force.

Shown in the front row of the photo, left to right, are: *Andrew Liger*, head Industrial Research Labs.; *James L. Ramsey*, manager Railroad Sales; *F. H. Tholen*, sales manager; *Ford Ballantyne, Sr.*, vice-president, secretary and treasurer; *Ford Ballantyne, Jr.*, vice-president and general manager of the Ford Division; *Robert B. Semple*, president, Wyandotte Chemicals Corp.; *P. N. Burkard*, manager Industrial, Railroad and Aircraft Dept.; *Robert J. Racine*, manager Industrial Sales; and *C. E. Smith*, administrative assistant to Mr. Ballantyne, Jr.

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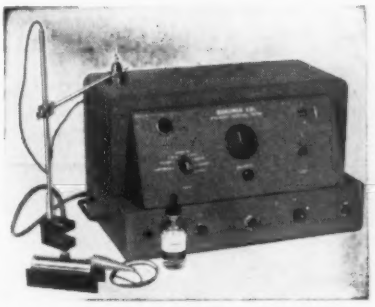

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7. Requires no graphs, no charts, or calculations.
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Donald E. Anderson, director of technical service, is at extreme right, second row. Other men are the 17 district sales managers of the Ford Division and members of the technical service and research staffs.

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(WITHOUT REGENERATION)

at 2¢ — 4¢ per Gallon

The Enley PUP Model 616

If you are a distilled water user, get mineralized water at a lower cost per gallon than can be obtained from any Unit of comparable size.

The Enley "PUP" — is constructed of high temperature Acrylic resin throughout and comes packed with ion-exchange material, carborundum porous stone and fiberglas screen filters.

MODEL #316 ENLEY "PUP" — produces 300 gallons of demineralized water from your water tap before resin is exhausted. Comes packed with 3 pounds of ion-exchange material. **COMPLETE $49.95**

MODEL #616 ENLEY "PUP" — produces 900 gallons. Comes packed with 10 lbs. of ion-exchange material. **Special Feature** — ion-exchange material can be regenerated in the Unit—cost can be as low as 1¢ per gallon. **COMPLETE $99.95**

Other units available of larger resin capacity at comparable prices. Write for full details.

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mineral content parts per million (as $CaCO_3$)	output-Gallons per refill (1 pound of material)	cost per gallon per lb. of material — in cents
50	210	1.4¢
100	102.5	2.75¢
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based on material costing $3.25 per lb. and credit of 50¢ per lb. for exhausted material returned to Enley Products Inc. NET COST OF MATERIAL $2.75 per lb.

Based on raw water containing 100 ppm mineral content as $CaCO_3$. Prices f.o.b. Brooklyn, N. Y.

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Fielden Instrument Division of Robertshaw-Fulton Names Sales Representative

Fielden Instrument Div. of *Robertshaw-Fulton Controls Co.* has appointed *H. J. Klug Co.* sales representatives for Nebraska and Western Iowa. The division is a producer of industrial instrumentation and electronic control devices, and is one of seven manufacturing divisions of the company.

Pennsalt President to Retire; Drake Named Executive Vice-President

George B. Beitzel, president of the *Pennsylvania Salt Mfg. Co.* has expressed to the Board of Directors his desire to retire as chief executive later this year when he completes twenty-five years' service with the company. At the same time, he recommended that *William P. Drake* be appointed executive vice-president, and elected to board membership. Both recommendations were approved.

While only 42 years of age, Mr. Drake has been a member of the organization for 21 years. He was first employed as a student trainee during summer vacations while still studying at Bowdoin College. After three years of technical training in several of the company's industrial chemicals plants, he was assigned to the sales organization. From 1941 to 1949 he served successively as sales manager of the chemical specialties department, assistant vice-president, and vice-president in charge of sales. He became president of the Industrial Chemicals Division in March 1954 when expansion of the consolidated company led to the formation of two new major operating divisions.

Mr. Beitzel became the 13th president of this 104 year old company in 1949. He was the first chief executive to be selected from the sales organization. A native Philadelphian, he attended the University of Pennsylvania, and began his business career with the Commercial Trust Company of Philadelphia. He joined Pennsalt following an association with the Yarnall Paint Co. of which he was vice-president. His many business and community activities include board memberships of the Pennsylvania and Philadelphia Chambers of Commerce, Fidelity-Philadelphia Trust Company, Delaware County and Methodist hospitals, and the Crime Prevention Association of Philadelphia. He is a member of the Union League and Midday Club of Philadelphia, the Community Methodist Church of Springfield (Delco) and is president of the Home Missionary Child Care Society of Philadelphia.

Manufacturers' Literature

Tumbling Abrasive

Simonds Abrasive Co., Dept. MF, Tacony and Fraley Sts., Philadelphia 37, Pa.

A 4-page catalog bulletin, Form ESA-236 describes Borolon aluminum oxide lumps and grain for barrel finishing a wide variety of parts and materials. They are efficient for deburring, putting a radius on small parts and precision finishing.

Waste Water Reclamation for Industrial Purposes

Graver Water Conditioning Co., Dept. MF, 216 W. 14th St., New York 11, N. Y.

Technical Reprint T-129, discusses the treatment of sewage plant effluent for water reuse in process and boiler feed.

Fully documented and illustrated,

this article examines current developments and design factors in the use of this potentially rich source of water. Neglected by much of industry in the past, treatment of sewage effluent has proved itself valuable enough in many installations to justify its reconsideration by all industrial planners.

Typical plant layouts and result sheets are shown and discussed, important cost factors are considered, and applications and equipment are thoroughly described in this paper. A bibliography is provided for those who want to investigate the subject further.

Industrial Chemicals

The Harshaw Chemical Co., Dept. MF, 1945 East 97th St., Cleveland 6, O.

A 24-page booklet lists alphabetically the company's industrial chemicals. Copies are available by writing to the company at the above address.

Products and Plating Processes

Hanson - Van Winkle - Munning Co., Dept. MF, Matawan, N. J.

A new four-page, two-color bulletin PP-100, listing its line of products and electroplating & metal cleaning processes, is intended, by the company, to serve as a handy reference guide. The bulletin lists 261 products under 63 different classifications. These products will serve every chemical and equipment requirement in the metal finishing industry. Another section outlines 17 plating and cleaning processes and their applications.

Included in the bulletin is a description of ten technical, laboratory, training, and research services available to H-VW-M customers.

Phosphate Conversion Coating

Oakite Products, Inc., Dept. MF, 118 Rector St., New York 6, N. Y.

Manufacturers whose painted steel products must withstand long exposure to humidity and the elements will be interested in a new booklet, "How to Apply Zinc Phosphate Coatings to Steel in Preparation for Painting." The booklet describes the zinc phosphating materials used in the Oakite CrysCoat Process to give paint-anchoring, corrosion-resisting coatings that usually weigh more than 200 milligrams per square foot of surface.

The booklet illustrates and explains the action of the process in converting the steel surface into a complex, heavy phosphate layer chemically bound to the metal, and shows how this coating improves paint adhesion and prevents the spread of corrosion under the paint, prolonging paint life as much as ten times. Common uses, solution strengths, and temperatures of the various zinc phosphating materials — for spray washing, tank immersion, and final rinsing — are described. The booklet also outlines the simple control procedure required by this process.

Pressure-Sensitive Tapes

Minnesota Mining and Mfg. Co., Dept. MF, 900 Fauquier St., St. Paul 6, Minn.

Hundreds of ways in which pressure-sensitive tapes serve the nation's metalworking industry are described in a new 56-page manual.

The manual contains 311 illustrations showing how 47 of the more than 300 available "Scotch" brand pressure-sensitive tapes can be used by nearly every segment of the metalworking industry. It is being presented, 3M explained, as a survey of a few representative applications showing where, how, and why these tapes are used by the industry.

To facilitate use the manual is divided into sections covering tape uses for machining and finishing, electroplating, stamping and fabricating, welding, product assembly, painting, product promotion, packaging and shipping, plant maintenance, and various miscellaneous operations. In addi-

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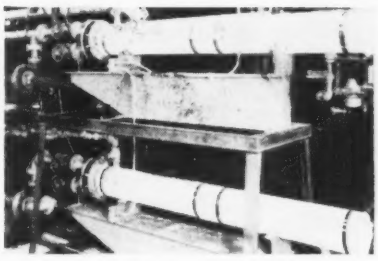

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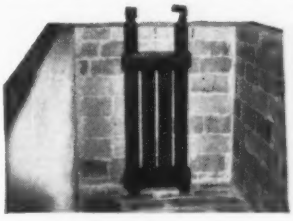

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tion, special sections are devoted to office uses; automatic, semi-automatic, and manual dispensing equipment; engineering and development services; and a tape data section covering properties for each of the 47 tapes.

Filtration

Pall Filtration Companies, Dept. MF, 30 Sea Cliff Ave., Glen Cove, N. Y.

The first in a regular series of news bulletins on porous media and filtration engineering has just been published. Named "Poro-Scope," the new bulletin will be published bi-monthly and sent to research, design, development, and process engineers, and other interested people in the process industries. It is designed not only to provide news of the filtration field but also as a forum for discussion of all phases of filtration and gas dispersion.

The first issue, released January 28, 1955, contains two discussions of major importance; one on a new technology which makes possible low-cost, porous stainless steel filters, the other on filter area and its significance in filter purchase. The latter is covered in a "Filter Forum" which will be continued in every issue. Other regular features will include "Science in the News," presenting capsule versions of scientific topics of current interest, and demonstrations by "Miss Poro" of filtration engineering facts.

Precut Masking Tape

W. H. Brady Co., Dept. MF, 727 W. Glendale Ave., Milwaukee 12, Wis.

A new 6-page illustrated bulletin gives many practical suggestions on how to save time and cut costs in spray painting and other metal finishing where masking is necessary. The new folder, Bulletin No. 160-C, describes in detail actual case histories with photographs of production and other applications using pre-cut protective masks.

The applications shown include paint spraying, flow coating, dipping, brushing; anodizing and plating; machining; sandblasting and tumbling. Also sealing and protecting products, parts and assemblies during processing, handling, storage and shipment to keep them free from dirt, dust, moisture, scratching, etc.

Ventilating and Exhaust Systems

American Agile Corp., Dept. MF, 5461 Dunham Road, Maple Heights, O.

A comprehensive eight-page brochure is designed to aid companies in selecting and installing corrosion-proof polyethylene ventilating and exhaust systems.

The purpose of the free literature is to enable firms to adapt the "do-it-yourself" trend in installing such fabrications by using completely pre-fabricated components and fittings. One section illustrates and describes various possible complete installations, and explains how potential users may compute necessary materials plus the cost.

Overall, the brochure covers such components as polyethylene seamless ducting, duct fittings, exhaust hoods, centrifugal fans, weather caps, and others. Actual photographs of other polyethylene ventilating and exhaust systems and components are likewise included.

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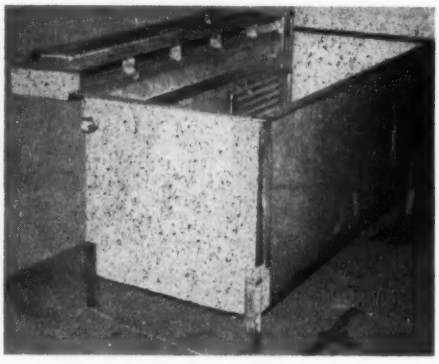

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Manufacturers of Welded Fabrications to Specification

Teflon Filter Cloth

Porous Plastic Filter Co., Dept. MF, 30 Sea Cliff Ave., Glen Cove, N. Y.

Data on "CPS", the "Controlled-Pore Size" filter cloth of Teflon for corrosive liquid and gas filtration are compiled in a new bulletin, T-112.

Made in two porosity grades, with 20 times the tensile strength of solid Teflon, the chemical and heat-resistant cloth is suggested for use in drum, disc and plate type chemical filters as well as in the form of dust bags for handling corrosive and high temperature materials. The new bulletin provides chemical- and temperature-resistance information, as well as physical properties and flow capacities of the two porosity grades of filter cloth offered.

Vapor Degreasing Equipment

Ramco Equipment Corp., Dept. MF, 1373 Lafayette Ave., New York 59, N. Y.

A new bulletin, #953-1, describes vapor degreasing, its advantages and the latest equipment available.

The bulletin illustrates when vapor degreasing may be used to free metal surfaces from grease, oil, resin, wax or lubricants. In diagrammatic drawings, it illustrates the fundamentals of vapor degreasing and *how it works* to dissolve oil and grease with solvent vapors of trichlorethylene and perchlorethylene.

Cut-away illustrations show the various types of vapor degreasing equipment available from the manufacturer and how each meets a specific cleaning problem. The bulletin describes the three fundamental cycles of degreasing — pure vapor, vapor-spray and liquid-vapor — and where each is utilized in the equipment.

Also shown are several standard and custom designed machines, and a partial list of articles which can be cleaned by vapor degreasing.

Sandblast Machines

Leiman Bros., Inc., Dept. MF, 102 Christie St., Newark, 5, N. J.

A new four-page Bulletin No. 1555 is now available, illustrating and describing the company's complete line of sandblast machines, including standard cabinet type, upshot type, portable tank type, automatic type with rotating basket inside cabinet, portable blast nozzle type for large pieces, bench type cabinet model for laboratory and small shop use and a compact motor driven air compressor for plants having no air supply. Complete details of dimensions, construction, work range and operations covering cleaning, deburring, surface preparation stenciling, and mat finishing, are given.

Dustless Mineral Shot for Blast Cleaning

Baldwin-Hill Co., Dept. MF, 500 Breunig Ave., Trenton 2, N. J.

A four-page, two-color technical bulletin, just published, describes the characteristics and performance of the company's new non-metallic, dustless Mono-Kleen mineral shot for blast cleaning. Savings which have been achieved with the shot in production time, material costs, and blasting-equipment maintenance in foundries, aircraft plants, metalworking shops, and other industries are described.

The bulletin details the physical and chemical characteristics of this non-conductive, non-corrosive cleaning

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Increase Production

easy to control . . . cuts down on trouble that entails costly delays.

Save Time

can be operated at a higher speed.

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gives unbelievable uniformity of deposit in recesses . . . brighter, white color.

Write for **FREE** *bulletin revealing tricks on improving your nickel plating and cutting costs.*

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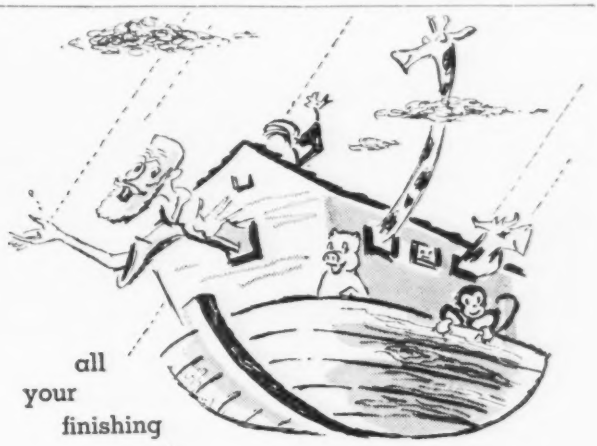

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leaders in finishing equipment for over half a century
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material. It describes the ability of the sperical mineral shot to clean uniformly in one dust-free pass, leaving a grime-free and film-free surface as an excellent paint anchor. Before-and-after photographs show clearly the performance of the mineral shot in blast-cleaning a number of typical castings.

Types of shot available and methods of packaging are described.

Chemical Pumps

Chempump Corp., Dept. MF, Station E, 1300 East Mermaid Lane, Philadelphia 18, Pa.

Bulletin 1010, just released, presents detailed data on the expanding line of seal-less, leakproof Chempump centrifugal pumps. In 16 pages, it gives information on sizes, horsepowers, heads and capacities, dimensions, materials of construction, design data, construction features and direct user benefits.

Three new models are introduced in this bulletin, with all necessary design and construction information. A total of six different model series are described. These six range in sizes from 1/8 to 7½ horsepower, and give leakproof, low maintenance pumping at heads to 195 feet, capacities to 250 g.p.m.

Protective Coatings

The Atlas Mineral Products Co., Dept. MF, Mertztown, Pa.

A new bulletin on protective coatings, No. 7-2, devotes two pages to each of the company's standard coatings. Included in the bulletin are neoprene heavy duty, neoprene extra heavy duty, styrene, chlorinated rubber and epoxy resin based coatings. The firm manufactures a complete line of corrosion proof cements, coatings, linings and rigid plastic fabrications, pipe and fittings.

Vapor Degreasing

Metalwash Machinery Corp., Dept MF, 901 North Ave., Elizabeth 4, N. J.

A free 12-page illustrated booklet "What You Should Know About Vapor Degreasing" is offered with an introduction on the principle of vapor degreasing. The booklet describes the solvent cycle, the vapor degreaser, the vapor spray vapor degreaser, the liquid liquid vapor degreater, and a new hydraulic lifter for batch type degreasers.

News from California

By Fred A. Herr

H. E. Dyer, Inc., of Paramount, Calif. which, in the five years of its existence has mushroomed from a Quonset-hut-sized plating plating shop to a 23,000 square foot plant in which is handled most of the original bumper plating and bumper salvage plating for three of the Ford Motor Co.'s western assembly plants, is currently engaged in still another expansion program. The firm's plant at 16424 Minnesota Ave., is situated on the northern edge of Long Beach, about 15 miles southeast of downtown Los Angeles.

H. E. "Ed" Dyer, Jr., general manager, reported to METAL FINISHING

A barrel load of bright nickel with a nickel's worth of

NICKELITE

CORROSION RESISTANCE UP 30% TO 100%

With Nickelite you can get 13 to 22 hours of salt spray exposure with 0.00006 inch of barrel nickel, instead of 11 to 13 hours. Actual salt spray tests show even greater improvement with thicker deposits. And you're saving money, too!

WRITE FOR FREE FOLDER ON MODERN BARREL PROCESSES

Concentrated to quadruple strength — you don't ship, store or handle water! Shipping weight cut 275% — no deposits, no carboy returns. Stable, efficient, easily stored, easily used — a capful of Nickelite is enough for a barrel load of nickel.

Slater's Research

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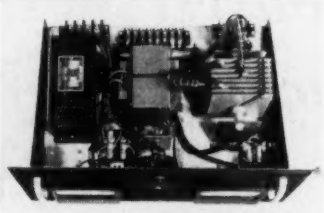
DOES YOUR PLATER HAVE "Rheostat Nerves"* ?

AUTOMATION PLATING

is his cure and you net 10 to 1



CONTROL PANEL

FOR THE LOW COST of $150 you can install automation controls for plating which will save you up to $1500 the first year. Costly rejects and wasted man hours are eliminated by the custom engineering of automatic controls which, when incorporated into existing rectifiers deliver constant voltage regardless of load change.

Our Services and Products Are Guaranteed to Save You Money

WRITE OR PHONE FOR FREE CONSULTATION

*Rheostat nerves — frustration caused by constant manipulation of rheostat knife switches.

MACARR Inc.

2458-60 ARTHUR AVE.
BRONX 58, NEW YORK

Phone:
WEllington 3-2643

that work is nearing completion on the installation of the following new equipment: A 500 gallon bright copper tank; and a 1500 gallon bright nickel tank for use on automobile bumper salvage plating. The latter tank supplements an existing nickel tank and, according to Dyer, will step-up production in that department 50% per shift. The shop operates on a two-shift basis. Also included in the present expansion program are new general and executive offices.

The plant is equipped to do copper, nickel, chromium, cadmium and zinc plating, barrel cadmium plating, phosphating, chromating, and black oxide work.

H. E. Dyer, Sr., founded the firm in 1950 and still serves as president. He still likes to take a hand in the shop occasionally and, during the visit of this writer to the plant, was pointed out by his son, busily engaged in running a polishing machine.

A new galvanizing plant with air hoists and two galvanizing vats, each with a capacity for 70 tons of molten metal, is included in a $500,000 expansion and modernization program recently completed by Hubbard & Co., manufacturers of pole line hardware, at its Emeryville plant adjacent to Oakland, Calif. The program represents the firm's fifth major expansion since its establishment in Emeryville in the mid-1920's. The new galvanizing building and added space for assembly operations and raw storage increased floor space by some 40,000 square feet. The new plant enables the company to meet its own galvanizing requirements and also to handle galvanizing contracts.

Glen J. Beckwith, vice-president, Metallon Products, Inc., 1841 Randolph St., Los Angeles, reports his firm has purchased the former Technical Glass Co. plant at 2050 East 48th St., Vernon, Calif.

The newly acquired unit in the Metallon chain of plants includes 25,000 square feet of factory area for production of door knobs, glass push plates, drawer pulls and a line of brass lock sets. Metallon Products took over land, buildings, dies, tools and equipment, as well as trade names and customers. *Howard Smith*, secretary of Metallon Products, has been named manager of the Vernon plant.

The firm also operates a plant in Canfield, O., where stainless steel stampings for the plumbing trade are produced, including soap dishes, washers, flanges, tub plates, etc. The Los Angeles plant produces bed casters, auto parts, lock parts, plumbing flanges, shower curtain rods and miscellaneous plumbing items. Complete automatic plating and polishing facilities, including barrel finishing equipment, are available in the several production buildings which constitute the firm's Randolph St. facilities in Los Angeles.

Beckwith has been active for a number of years in the affairs of the A.E.S., and this year serves as a member of the board of managers of Los Angeles branch.

Following visits to Los Angeles and San Francisco in February, *Myron Diggin*, vice-president of Hanson-Van Winkle-Munning Co. of Matawan, N. J., and Mrs. Diggin took off on a pleasure trip through Mexico. Mr.

Alert

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Packer Machine Co.	.... AUTOMATIC POLISHING EQUIPMENT
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These Are a Few of the Outstanding Lines We Represent Exclusively on the West Coast

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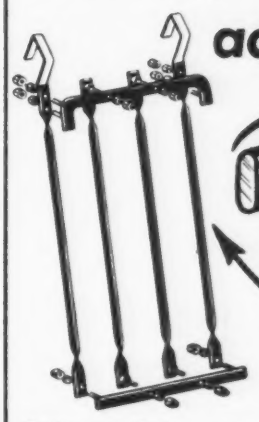
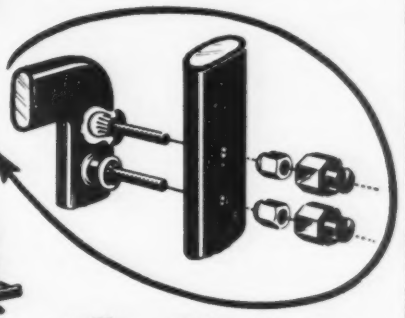
SAN FRANCISCO SEATTLE

Plating Racks you can adjust to the job





Thinker Boy Racks are assembled from precoated members and tips. BELKE Vac-Seal Assembly seals the joints—only contact tips are exposed to the solution. Racks are easily disassembled without damage to coating.

Available as completely assembled racks or precoated rack members and tips.

Send for literature.

Effect BIG Saving

When Thinker Boy Racks for a certain job are no longer needed you can respace the members or disassemble and use the parts for other racks.

No added investment. Just order Thinker Boys when you buy racks. Instead of ceilings cluttered with no longer needed racks, you'll soon have a supply of Thinker Boy Parts — be able to assemble coated racks of your own design in a matter of minutes. Ask your BELKE Service Engineer or write for details.

Belke MFG. CO., 947 N. Cicero, Chicago 51, Ill.

EVERYTHING FOR PLATING PLANTS

Diggin and *Lloyd Gilbert* of Rock Island, Ill., came to Los Angeles to attend a finishing symposium presented in February by the American Ordnance Association.

Dean Williams, formerly of the Los Angeles metal finishing sales staff of the L. H. Butcher Co., was named manager of all operations of the firm's Portland, Ore., branch, effective March 1. Williams is a UCLA graduate with a degree in chemistry. He was chief chemist at North American Aviation, Inc., prior to joining Butcher in 1945.

Other staff changes announced by *Jack Raskin*, west coast manager of the L.H.B. metal finishing department, are: *Warren Blazer* from chief estimator to sales engineer, and *Paul Kerans* from service engineer to the sales staff. A new staff addition is *Charles Thomas* as sales engineer for Roto-Finish and pressure-blast equipment and processes.

Subjects of pertinent interest to electrical power maintenance in their own finishing shops were found by plating plant operators on the agenda of the 1955 Electrical Maintenance Conference held at the University of Southern California, Los Angeles 6 and 7 under the sponsorship of the Southern California Electrical Maintenance Engineers Ass'n. Conference technical sessions were scheduled for the morning and afternoon of April 6 and morning of April 7 with the afternoon of the second day devoted to a field trip. Subjects presented included:

Economics of planned preventive maintenance; maintenance of electronic equipment; maintenance of electrical equipment in industry; electrical safety codes as they affect the maintenance department; special tools, instruments and methods applying to maintenance; and maintenance of electrical equipment in small plants. *C. W. Doane* served as conference general chairman.

A. R. Hunter has joined International Rectifier Corp. of El Segundo, Calif., as a member of the application engineering staff. For the past seven years he was with Wagner Electric Corp. of Los Angeles as a sales engineer.

Turco Products, Inc., Los Angeles, has announced appointment of *Archie K. Beard* as manager of the metal processing division and eastern divisional manager of the firm's new Chem-Mill division. His headquarters will be at the Newark, N. J. plant. Beard joined the firm shortly after the close of World War II. He had previously served as chief chemist for the Phoenix Division of Goodyear Aircraft.

Associations and Societies

AMERICAN ELECTROPLATERS' SOCIETY

AES Exhibitors Reach 200 Mark

American Electroplaters' Society will attract about 12,000 production and engineering executives to its *Industrial Finishing Exposition* and *42nd Annual Convention*. This was the estimate made by *Eugene L. Combs*, general chairman of the convention committee.

In addition, Mr. Combs reports exhibitors contracting for space at the exposition have increased to about 200. This will be the fourth finishing

★ BUFFING NU SPRA GLU
Liquid buffing compound
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since 1937

★ BRUSHING NUGLU
Grain and Nuglu mixture
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Guns, pumps, and valves
since 1945

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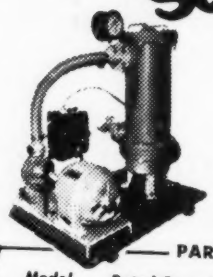
Filter your Solutions!



50-2400 GAL/HR.
Model LSI-10
Cap. 100 gal/hr H.T. Lucite Filter Assembly. Stainless pump . . . totally enclosed Motor . . . portable . . . Wt. 40 lbs . . . 12"x16"x16" high.
Distributors in principal cities.
Write for literature.

* Reg. App. For

PARTIAL LIST OF MODELS

Model	Rated Capacity	Overall Size	Weight
LSI-5	50 gal/hr	11"x14"x12"	30 lbs.
LSI-10	100 gal/hr	12"x16"x16"	40 lbs.
ASI-300	300 gal/hr	2'x2'x2'	125 lbs.
ASI-600	600 gal/hr	2'x2'x2'	150 lbs.
RLS-1200	1800 gal/hr	2'x3'x3'	300 lbs.

SERVICE . . . Filters practically any acid or alkaline solution from pH 0 to pH 14; removes particles down to one micron in size. Strainer stops metallic objects.
DESIGN . . . **Filter Assembly** fabricated of stainless steel 316, high temperature lucite, rubber-lined, Haveg or Sethrin* resin. **Filter Tubes** of cotton, dynel, porous stone or porous carbon. **Pumps** fabricated of Hastelloy, stainless 316 or plastic; centrifugal or self-priming. **Motors** drip-proof, totally enclosed, or explosion proof, 110 or 220 volt, single or three-phase, 50 or 60 cycle, sleeve or ball bearing. **Hose**—special acid and alkali resistant. **Base**—Linen Phenolic laminate on rubber tire ball bearing casters.

Sethco MANUFACTURING COMPANY
74 Willoughby Street · Brooklyn 1, New York

xposition sponsored by AES. It was last held in Chicago, in 1952. The 1955 show will occupy approximately 30,000 square feet of exhibit area, featuring finishing equipment, services and supplies.

Both show and technical sessions are scheduled for Public Auditorium in Cleveland, June 20th through 23rd. By keeping both activities under one roof, industry people attending should be in a position to take full advantage of both exhibits and technical sessions. Two meeting rooms have been arranged in the hall to handle all technical papers. Those in attendance should be able to hear a representative group of discussions on subjects they choose because of morning and afternoon scheduling arrangements. To provide an even better opportunity for showgoers to see exhibits, no technical papers have been scheduled for Wednesday afternoon, June 22nd.

Papers planned cover subjects in the broad fields of design, construction, engineering, maintenance and operations.

Expedited registration cards are being distributed throughout the industry by inserts in industrial finishing publications, direct mail to key personnel and by exhibitors. These also can be obtained upon request from Mr. Harold E. Bartlett, exposition manager, 1955 Industrial Finishing Exposition, c/o American Decorating Company, 1849 West 24th Street, Cleveland 13, Ohio.

Dr. Ralph Schaefer, President, AES, (Left), and Gene Combs, General Chairman.

AES membership is not required for attendance at the meetings or the exposition. Charges will be made for the various social functions to be held in several hotels. The complete package of tickets can be purchased at the Registration Desk for $17.50 per person during the convention.

Arrangements have been made with the hotels in Cleveland to set aside blocks of rooms for the use of those attending the convention and exposition. Make your hotel reservations as early as possible to Mrs. L. D. Perkins, Housing Bureau, Room 511, Terminal Tower, Cleveland, Ohio. The hotel in which you are placed will confirm your reservation directly to you. Be sure to state specifically the type of accommodations desired and time of arrival.

Rochester Branch

The *Empire State Regional Meeting* of the American Electroplaters' Society will be held on Saturday, April 16th at the Hotel Seneca in Rochester. Host is the Rochester Branch. Participating are the Buffalo, Syracuse, Capitol Dist. & Southern Tier Branches.

PROGRAM

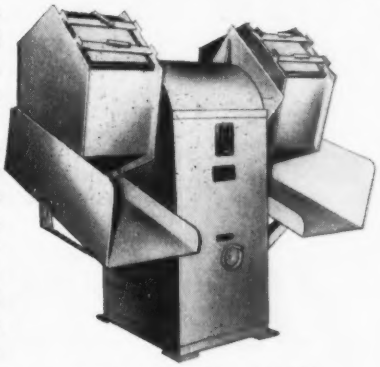
12-2:00 P. M. — Registration — Mezzanine.

2:00 P. M. — Educational Session— Ontario Room. *Frank Benckman*, Session Chairman. "Outdoor Durability of Decorative Finishes," *Cleve-*

NEW! RAMPE TWIN
PRECISION BARREL FINISHER

Super Twin With Double Capacity

Provides larger volume capacity—4 cu. ft. (2 cu. ft. per barrel). Sturdily built and powered by a ¾ H.P. 220/440 volt, 3-phase motor — Variable speed drive — Barrels can be vinyl plastic lined, if desired. Movable chutes act as safeguards when tilted to the rear. Tote boxes can be furnished in place of movable chutes.



Prices from $735.00 to $995.00 depending upon equipment.

OTHER RAMPE BARREL FINISHERS

Three other Rampe Barrel Finishers are available — 2 single units and 1 Twin model. They range in price from $99.50 to $685.00, depending upon size and equipment.

SEE OUR EXHIBIT AT INDUSTRIAL FINISHING EXPOSITION, JUNE 20-23, CLEVELAND, OHIO.

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"U.S." white chemical porcelain cylindrical pots or rectangular tanks are ideal for pickling, plating or stripping small parts. They are corrosion-proof all the way through, possess excellent resistance to heat shock, are sturdy and durable. Their gleaming white surface improves solution visibility and makes for easy cleaning. Capacities from 2½ to 200 gallons in cylindrical pots; 4 to 40 gallons in rectangular tanks.

At your plating supply dealer or write direct. 64E

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Akron 9, Ohio

Nixon—Research Div. General Motors Corp.; "Nickel Electroforming," *Dr. Dodd Carr*—Bart Manufacturing Inc.; "Use of Vinyl Coatings in the Plating Industry," *D. R. Meserve*—United Chromium Inc.

2:00 P. M. — Ladies Program — Lilac Room.

6:30 P. M. — Banquet, Entertainment and Dancing — Main Ballroom.

Registration Fee $7.50. Tickets are available in Rochester from Rochester Branch Officers, and a member of suppliers representatives. In other branches tickets are available from: Syracuse — *Ken Parnell, Vince McConnell, Lindley Wood;* Buffalo — *Jim Moneypenny, Bill Fotheringham* and *Bert Kirchoff.* Capitol Dist. — *Paul Calahan;* Southern Tier — *George Zurenda, Merle Ihrie, Austin Fletcher.*

This first Empire State Regional Meeting will be an enjoyable and worthwhile event. Plan now to attend. The Committee would appreciate receiving your reservations at your earliest convenience in order to make the necessary arrangements at the hotel.

Ed Wallin,
Chairman

Los Angeles Branch

Earl W. Arnold, assistant manager of the plating supply division of the L. H. Butcher Co., was elected president of Los Angeles Branch of the *American Electroplaters' Society* at the February 8 meeting in Rodger Young Auditorium.

Arnold succeeded *G. Stuart Krentel* of Hanson - Van Winkle - Munning's Southern California branch office.

Other officers chosen are: 1st vice-president, *L. Truman Stoner* of Chief Products Co.; 2nd vice-president, *George Magurean,* Redi-Strip Co.; librarian, *Norman K. McEwan,* Virtue Bros., Mfg. Co.; secretary, *George Hetz,* Mefford Chemical Co.; treasurer, *Larry O'Neil,* L'Hommedieu & Sons Co. The choices, on the whole, represented advancements from other posts which the candidates had filled with success during 1954.

Krentel, *Harvey Hunt* of Alert Supply Co., and *Glen Beckwith* of Metallon Products Co., were named to the board of managers. Arnold, Beckman

Earl W. Arnold

and Stoner were chosen as delegates to the national convention, with *Jack Beale* of Crown Chemical & Engineering Co., *Don Bedwell* of Hall-Mark Co., and *Kenneth C. Johnson* of Industrial Silver as alternates.

The slate of candidates was submitted by a nominating committee composed of Bedwell, *Earl Coffin* and *Walter Behlendorf.* Installation will

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Industry's Abrasive
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IMPROVES PRODUCTION PER WHEEL OR BELT
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• We're not asking you to commit yourself blindly with a large order. We do suggest that you place a *trial* order for GRIPMASTER . . . a 75 pound pail or a package unit of 4 one gallon cans. Either will give you sufficient quantity to make a thorough competitive test. Then, if your production volume warrants, you can order GRIPMASTER in 660 pound drums.

When we ship your trial order, we'll let you know where our nearest distributor to you is located. Then you can deal directly with him and get his personal service on wheel and belt problems as well as other Lea products.

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Insure successful, economical, uninterrupted

ZINC PLATING

by purifying cyanide zinc plating solutions with

McKeon's Zinc-Brite
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No Other Purification Treatment Required.
Simplifies Zinc Plating Procedure.
Substantially Reduces Overall Plating Costs.
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take place at the March meeting at which time a sergeant-at-arms and chairman of the research and other standing committees will be appointed by the incoming president.

The election night meeting was attended by nine past-presidents, including Bedwell, Coffin, Behlendorf, *Roy Lostutter, Myron Orbaugh, Ed Wells, Al Sulzinger, Richard Wooley* and *John Millhorn.*

Sergeant-at-arms *Hal Wannamaker* introduced the following guests: *Lawrence Becker* and *A. C. Greenwaldt* of North American Aviation; *Al Polucha* of Wm. R. Whittaker Co.; *M. S. Sidall,* Promat Division, Poor & Co.; *Burton Adams,* Henshaw Mfg. Co.; *Paul Kerans,* L. H. Butcher Co.; *James Hodges,* Alert Supply Co.; and *James M. Routin,* Sanford Process Co.

Orville M. Brown was initiated into membership and applications were received from *William Kurechi, Al Trott* and *Woolford Schwartz.*

It was voted that the by-laws of the branch, which heretofore were available only in mimeographed sheets, be printed in booklet form for convenient distribution to all members.

A report on the progress of arrangements for the branch's 25th annual technical session (March 19th, Ambassador Hotel, Los Angeles) was presented by George Hetz and several of his sub-committeemen. The various reports indicated that there is in the making the most elaborate technical session and dinner dance in the history of the branch, and that the door prizes, always a feature of this annual event, will be available in numbers to assume a prize for almost every couple attending the ball. *Louis G. Shoals,* formerly a member of the branch and now a representative of the Ambassador Hotel, was on hand to explain the cooperation being attended by the hotel authorities in making the grand ball room and Cocoanut Grove available for the A.E.S. events.

No technical speaker was programmed for the February 9 meeting in order to allow liberal time for election activities. Films of a recent Los Angeles Rams football game were shown during an entertainment period after the close of the business session, with refreshments served "on the house."

Central Michigan Branch

The Central Michigan Branch held their annual Ladies Night Program at the Hotel Porter on the evening of February 8, 1955.

Approximately one hundred members and guests enjoyed an especially delicious roast prime rib of beef dinner. During dinner a string trio supplied a variety of selections making the dinner hour very enjoyable.

Following dinner Branch President, *F. Stuckenberg,* introduced the feature entertainment for the evening, Mr. C. Cairy, who proved to be a memory expert and proceeded to amaze the audience with a great number of feats of memory with numbers, words, letters, etc.

As a fitting climax to a full evening, the ladies were each presented with a very nice gift.

R. W. Boos,
Publicity

Rockford Branch

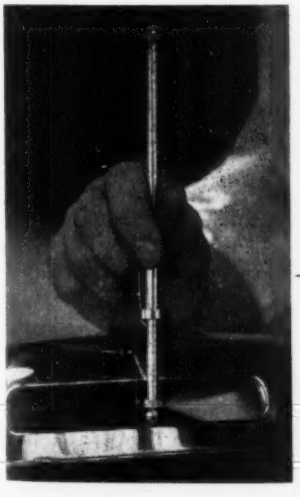
The regular monthly meeting of the

A magnetic thickness tester ...

POCKET HANDI-GAGE

FOR ELECTRODEPOSITED, HOT DIPPED OR PAINTED COATINGS ON STEEL

Tests thicknesses from 0.0001 to 0.015 inch. Each individual gage is separately calibrated to National Bureau of Standards thickness plates, resulting in an accuracy to 10% for thicknesses over 0.0002 inch. As simple to use as an automobile tire gage, the Pocket Handi-Gage may be used on the production line or in the lab. It's perfect as a "Go, No-Go" thickness gage at the plating tank or spray booth.



NO BIGGER THAN A FOUNTAIN PEN, BUT WHAT A JOB IT DOES!

Tests brass, cadmium, copper, lead, nickel, silver, tin, zinc, lead-tin and zinc-tin alloys, hot dipped tin and zinc, paint, plastic laminations, enamel and lacquer on steel and other magnetic metals. Gives results in SECONDS. Especially adapted for hard-to-reach areas. Comes in a pocket-sized case complete with magnets for various thickness ranges.

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The Southwest's Leading Supplier of Industrial Plating and Polishing

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Rockford Branch was held Monday, Feb. 14th at the Faust Hotel. Thirty-four members and guests enjoyed a very fine dinner.

With forty-eight in attendance for the business meeting, it was opened by President *Vern Wissen*. Minutes and reports were read and a nominating committee was named to report at the April meeting. Due to the Annual Educational Session and Banquet which will be held March 19th it was decided no regular monthly meeting would be held. Final arrangements for this affair were discussed and all seemed to be coming along very well. After the business session, *Lawrence Ray* showed a film entitled "Zinc Base Die Castings" which was very interesting. At the conclusion of the film Mr. Ray introduced *Merle Young* of Electric Auto-Lite Co. of Woodstock, Ill. and *Richard McGuire* of the Northern Star Plating Co. of Rockford, who proceeded to answer all questions thrown at them pertaining to die castings and the plating thereof. This turned out to be a very delightful and educational meeting.

E. J. Budden,
Secretary

Louisville Branch

The regular monthly meeting of the Louisville Branch was held Thursday, January 20, 1955, at Kapfhammer's Party House, 1506 South Shelby St., Louisville, with a dinner served at 6:30 p.m. President *J. W. Scholl* opened the business and open meeting at 8:00 p.m. with twenty-six members and guests present.

The roll call of officers was read and 2nd Vice-President *K. C. Reifstock* and Board of Managers *P. H. Pate* were reported absent. The minutes of the previous meeting were read and accepted.

Technical Sessions Chairman, *S. J. Beyer* reported that *R. O. Hull*, president of the R. O. Hull Co. of Rocky River, Ohio, will speak on "Methods of Testing" at the February meeting.

Membership was voted for *Bob Biendenbender*, Globe Chemical Co., 105 N. 15th St., Louisville.

A letter received from *T. K. Allison* requesting a transfer to the New York Branch from the Louisville Branch. Tom is now living in New Jersey.

A letter from the St. Joseph Valley Branch asking the Louisville Branch to support their member *Ralph D. Wysong* for the 3rd Vice-President at the National Convention in June, 1955. The letter was ordered to be placed on file.

A letter from C. R. Arbegust of General Electric Co. requesting his resignation in the society, giving his reason as no longer connected with the plating industry.

Herb Kennedy, of the Indianapolis Branch, gave a report of the Annual Tri-State Regional Meeting to be held Saturday, March 26, 1955, at the Hotel Deshler-Hilton in Columbus, Ohio. The afternoon session is held at 1:30 p.m. and the speakers are *Walter L. Pinner* and *Myron B. Diggin*. At 6:30 the Dinner-Dance and Entertainment Program will begin with fine music.

Three visitors from the Yale & Towne plant in Gallatin, Tenn., *R. L. Palmer*, *J. J. Gell*, and *G. Byxbee*, were introduced by *Dick Marshall*. *Bill Wilson* was introduced by *Al Engle* and *George Shake* was introduced by *Bill Francis*.

A motion was made by *Stan J. Beyer*

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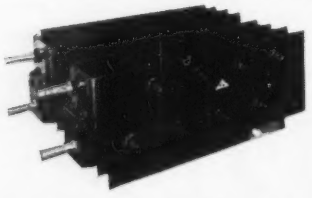
For the Finest in PLATING RECTIFIERS

A BETTER SOURCE OF DC POWER — MORE FOR YOUR MONEY

★ Operate from —40° to 225° F.
★ 50 to 50,000 Amperes DC
★ Built-in Voltage Regulator and Meters
★ Heavy Duty Transformers, Husky Fans

Two styles available—1. Selenium for cool zones, or 2. Magnesium copper sulphide for the hot, dirty jobs. Units still running after 4 years of constant duty.



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Magnesium copper sulphide rectifiers make your plating power supply more rugged and dependable. Magnesium radiator fins for fast heat dissipation and lighter weight. Matching pairs.

Model 4045—750 amps at 12 volts DC—1500 amps. at 6 volts DC. Operates on 208, 220 or 440 A.C. Weight 525 lbs. F.O.B. Indianapolis, Indiana.

SOME JOBBERS AND SALES TERRITORIES OPEN

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INDUSTRIAL CLEANERS
FOR
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SOAK TANK • ELECTROPLATING • WASH TANK
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CUTTING • GRINDING • HONING • LAPPING
AND RUSTPROOFING
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and seconded that the Louisville Branch enter an exhibit to the National Convention to be held in June, 1955, in Cleveland, Ohio. President Scholl appointed William W. Francis as chairman, to be assisted by Stan J. Beyer and E. W. Eckerle.

President Scholl turned the meeting over to Educational Chairman, Beyer who, after a brief talk, introduced *Dr. D. Gardner Foulke* of the Hanson-Van Winkle-Munning Co., Matawan, N. J., who spoke on "Fundamentals of Electroplating." It proved to be quite a technical session. Slides were shown and narrated by Dr. Foulke. Considerable discussion followed and Dr. Foulke was given a rising vote of thanks for a very interesting talk.

Refreshments were served—courtesy of *Richard Marshall* of the Hanson-Van Winkle-Munning Co. The meeting adjourned at 11:00 p.m.

J. G. Sterling,
Secretary & Treasurer

Newark Branch

The February meeting of the Newark Branch was held on the 18th at the Robert Treat with all officers present, except *John England* and *Clifford Struyk*.

Business matters taken care of included: passage of a motion to contribute $25 to the local Red Cross agency; the election of *Salvatore Fresco* and *Paul Theussen* to membership; the acceptance of applications for membership from *John R. Fiorito*, Gem Mfg. Corp., *Salvatore A. Mollica*, Wright Aeronautical Corp., *Ray J. Litterio*, Bart Mfg. Co., *Joseph Azzolino*, Wright Aeronautical Corp., and *Edward Herzig*, Electro Tech Corp.; and the transfer of *Austin Beebe, Jr.* from Detroit to Newark Branch. The nominating committee, *Robert Horrocks*, chairman, *Louis Donroe* and *Howard Cobb*, presented the following slate of officers as candidates to be voted on at the March meeting: President, *Thomas Austin*; First Vice-President, *William Grigat*; Second Vice-President, *Clifford Struyk*; Secretary, *Don Foulke*; Treasurer, *George Wagner*; Librarian, *Gus Bittrich*; Sergeant-at-Arms, *Dodd Carr*; Board of Managers — *John Gumm*, *George Reuter*, *Robert Horrocks*, *Robert Ehrhardt*.

Bill Grigat, pinch-hitting for Librarian Struyk, then introduced *Walter Prine*, who discussed the present nickel situation. He pointed out how government stockpiling cut down the amount of nickel available for industry and that distribution was made on as equitable basis as possible. There will be considerable increase in production in the near future which should insure adequate supplies, barring a major war or a greatly accelerated stockpiling program.

C. A. Kimmel, Dow Chemical Co., spoke to the sixty-three present on the finishing of magnesium, covering the requirements and methods. Important points made were: (1) Improved anodic coatings such as HAE and Dow No. 17 which are both really two-coat systems in that two types of films are laid down, one at low, the other at high voltage; (2) improved paints have been developed such as polyvinyl butyral formulations; (3) the importance of care in assembling dissimilar metals when magnesium is one of the metals and methods for overcoming this problem; (4) and increased interest in plated magnesium parts, including examples of recent applications. A

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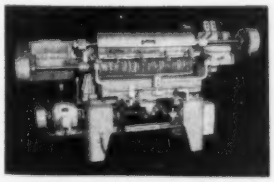

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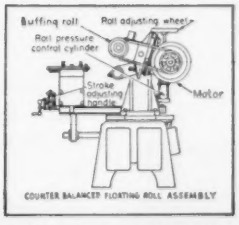

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number of questions attested to the general interest in the subject.

D. Gardner Foulke

Detroit Branch

The February 5 meeting of the Detroit Branch, in the Wayne Room of the Hotel Statler, was held jointly with the Plating Institute of Michigan.

The meeting opened with a Pan American World Airways film, "Wings Over Ireland." Everyone enoyed the commentator, but only the Irishmen in the audience could understand the natives.

Joe Gurski started the meeting by welcoming *Kurt McKinney* back after his confinement in the hospital. Joe also announced that *Jim McGarrigle* had pictures of the Christmas party and anyone could place an order if they wanted one. *Bob Racine* introduced three new applicants, who were then accepted into the branch as members. *Lee Morse*, membership chairman, announced that Detroit Branch membership now totaled 660. Lee then introduced *Wright Wilson*, *Jim Dunn*, *Herb Head* and *Robert Bolton*, all members of this committee. He made an appeal for new members, and requested each member do his utmost in soliciting new applicants.

At this time Mr. Gurski, opened the meeting asking for additional nominations from the floor for the officers of the 1955-56 society year. He did not receive any nominations and accepted the nomination committee's suggestions as follows:

President — *Lee Morse.*
1st. V.P. — *Howard McAleer.*
2nd. V.P. — *Bob Racine.*
Sec. Treas. — *Ed. Hubis.*
Educ. Chairman — *Doug Thomas.*
Board of Mgrs. — *Fred Olmstead.*

Fred Olmstead gave a short but very concise report on the Plater's Institute and the work they are doing. He then introduced *James Muller*, executive secretary of the Institute. Mr. Muller introduced the new officers of his group.

Two guests from the Milwaukee Branch were *Nick Servatious* and *Bob Iler* of Modern Plating, Freeport, Ill. Nick is making a tour with his Ford which has 24K gold trim.

Mr. Muller, chairman of the meeting, introduced the guest speaker of the evening, *B. Magruder* from Wayne University, School of Business Administration. Mr. Magruder's talk, "Cost Analysis for a Purpose," attempted to give the plater a picture of problems involved with cost. He pointed out several cases where cost as the accountant sees it was not the true cost picture. Mr. Magruder's talk was followed by a short question and answer period.

The meeting closed at 10:30, followed by refreshments for all.

Patrick J. Driscoll,
Publicity

Chicago Branch

On February 11, 1955 the monthly meeting of the Chicago Branch was held at the Western Society of Engineers. As is usual at Chicago Branch meetings, the business meeting and social session were held before the educational session.

At the business meeting the chief order of business was a discussion of branch exhibits and an addition to the slate of nominees for branch offices. *C. McComb* was nominated for second vice-president of the branch along with *Jim Connelly*.

After the business meeting and a fine dinner the group retired to the auditorium for the educational portion of the meeting. As is the custom at Chicago Branch Meetings the regular speaker was preceded by a panel discussion of member's questions on plating problems. Members of this

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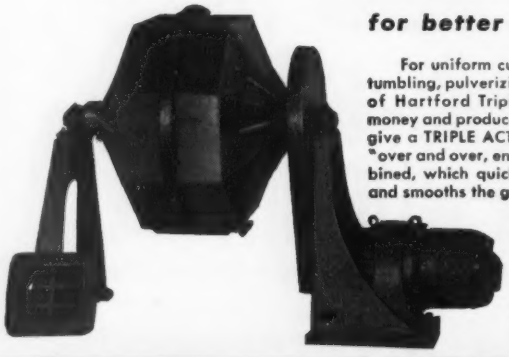

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month's panel of plating experts were:

Don Chiz, Poray, Inc.

Marion Longfield, Pheoll Mfg. Co.

Matt Dassinger, Nestor - Johnson Mfg. Co.

At the conclusion of the question period, *R. D. Miller* of the Sharonville Div. of the Electric Auto-Lite Co. gave an excellent presentation on two topics of great interest: Buffing, and The Deposition of Multiple Layers of Nickel.

Mr. Miller first discussed the buffing of bumpers at his plant. He traced the history of accumulation of problem from the plater's point of view as bumpers increased in complexity from the fairly simple shapes of prewar years to the complex and massive designs of today. In addition, he discussed the progress which has been made through the years in buffing compositions, buffing techniques, and plating baths.

The 43rd Annual Educational Session and Banquet of the Chicago Branch, held at the Conrad Hilton Hotel was an outstanding success.

The day's activities began with the showing of a color film: "The Editor of Products Finishing Eyes Japan" just prior to the educational session by *Ezra Blount*, Editor of Product Finishing.

The educational session was begun with a paper by *W. B. Coleman*, supervisor of application research, Victor Chemical Works, who spoke on: "The Applications of Phosphates for Metal Cleaning Purposes." Mr. Coleman's presentation was both interesting and very informative as indicated by the number of questions from the floor.

The second paper on the program was presented by *Ezra Blount*. His subject was; "A Survey of Organic Finish Application Methods." Again group interest was indicated by an interesting and provocative discussion.

The final paper on the program was presented by *C. F. Nixon*, head of the Electrochemistry Dept., Research Laboratories Div., General Motors Corp. Mr. Nixon's topic was: "Plating for Out-of-Door Durability." Mr. Nixon gave a survey of exhaustive research being done by his company in this field. He also indicated the effect of variables in the plating cycle on the corrosion protection obtained with plated coatings on automobile hardware.

After a short breather the group reconvened in the Main Ballroom to enjoy the lighter side of the day. The group had a delicious dinner, saw a fine show, and enjoyed dancing to the music of Lou Breeze and his orchestra.

Jerome Kuderna

Rochester Branch

The January meeting of the Rochester Branch was held on Friday evening, January 21, 1955; at the 40 & 8 Club and consisted of a business and educational meeting. A vote of thanks was given to the committee members of the Christmas party for a job well done: *Cecil Thornton*, *John Hourihan*, and *Richard Waite*. President *Ed. Wallin* announced the appointment of *Frank Beuckman*, *Fred Thiem* and *Harold Baker* as the 1955 Christmas Party Committee.

Announcement of a course in plating was made. This course is to be held on Thursdays at the Rochester Institute of Technology, and is to be a lecture and discussion course. Its purpose is to present and analyze the principles of chemistry and electricity involved in electroplating. The Empire State Regional Meeting is to be held at the Hotel Seneca, Rochester, on April 16, 1955. Edwin Wallin is chair-

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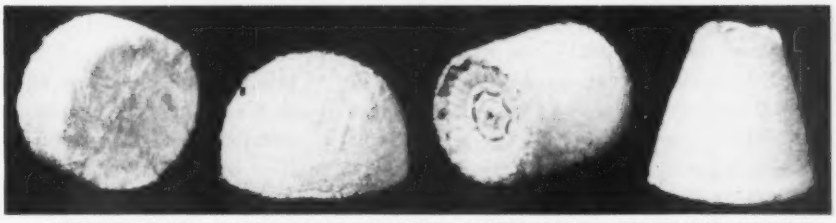

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man. The educational program should be very enlightening, and we promise a fine banquet and entertainment.

President Wallin read a letter to the branch which he received from *Ray Berghold* in appreciation of our granting him a branch honorary membership and the gifts received. Mr. Berghold retired from his position with the Frederick Gumm Chem. Co. as of January 1, 1955.

Frank Beuckman, librarian, introduced *John Duford* who spoke briefly on Lube-Lok bonded-to-metal lubricating. The main speaker of the evening was *Al Pope*, associated with the Pennsylvania Salt Mfg. Co., who gave an interesting talk on trouble shooting in metal cleaning. The information he presented should be of great value to many of our members. The meeting was later adjourned in favor of the usual refreshments.

Frederick L. Johnson,
Secretary

Baltimore-Washington Branch

The February meeting of the Baltimore-Washington Branch was called to order by President *Benderly* on Tuesday, February 8, 1955 at the Marling House in Baltimore.

Following a short discussion, *Raymond Stricklen, Jr.* was elected to the office of delegate. *Fielding Ogburn*, the retiring delegate was elected an alternate. *Theodore Katan*, Box 351, Baltimore 3, Md. and *William E. Kilgore*, 834 20th St., Newport News, Va. were elected to membership.

With business finished, Librarian *Jules Horelick* introduced the speaker, *A. G. Chamberlain*, Wilmington Plastics Co., who spoke on the "Uses of PVC in the Plating Industry." Mr. Chamberlain presented his subject very well and illustrated it with items selected from a table filled with various articles made of PVC. He explained the advancements that have been made in the forming and fabricating of this material, it's easy adaptability and it's amazing resistance to a high percentage of conditions to which plating equipment is subjected.

A demonstration was given of its welding qualities with *Mr. Ganzermiller* of Allied Research Products wielding the hot air torch.

Judging by the volume of questions Mr. Chamberlain was asked about this amazing material the interest in it was tremendous.

Carl H. Thiede,
Secretary

Cincinnati Branch

The February 23 meeting of Cincinnati Branch was attended by 34 members and guests. Minutes of the previous meeting in January were read and approved. Pres. *Bill Gordon* made appointments to the Permanent Tri-State Committee, these appointees being *Ezra Blount* and *Dick Evans*. A nominating committee for the election of officers was appointed, consisting of *Carl Truman*, *Robert Miller* and *Bill Albohn*.

Pres. Gordon appointed the following as delegates to the National Convention in Cleveland in 1955:

Delegates: *Bill Young*, *Chuck Wise*, *Roy Critchfield*.

Alternates: *Robert Miller*, *Bill Gordon*, *Russ Waters*.

Announcement was made that *Ed Roof* had been appointed research finance chairman for the branch.

A committee was appointed to make

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plans for the annual picnic to be held this summer. *Charles Foertmeyer* is to be chairman, assisted by *John Hoover* and *Art Gerada*.

Because of the conflict with the Tri-State Regional Meeting in Columbus, Ohio on March 26, it was moved, seconded and passed by the membership that elections for the following year be held at the April meeting.

The name of *Robert E. Wiedemann* was presented to the membership for admission to the Society. Those members present indicated their approval.

The speaker for the evening was *C. H. Sample* of the International Nickel Co. New York City, N. Y. Mr. Sample showed a series of colored slides, comparing the corrosion resistance of various metals such as zinc, cadmium and lead. In addition, there were some slides prepared on corrosion protection of copper, nickel and chromium coatings.

Following a rather lively discussion of many aspects of corrosion, members saw the film "Corrosion in Action" which had been prepared by the International Nickel Co. This was a rather long but very interesting film dealing with every aspect of corrosion, and was well reecived by the membership.

After the meeting, refreshments were sponsored by the Globe Chemical Co.

L. J. Howald,
Secretary

Buffalo Branch

Buffalo Branch of A.E.S. met March 4, 1955 at the Markeen Hotel in Buffalo, N. Y. *Ed Wallin*, president of the Rochester Branch invited the members of the Buffalo Branch to attend the Empire State Regional Meeting Saturday April 16, 1955. *Joe Ruff* announced the Annual Picnic will be on Saturday July 30, 1955 at the Kendall Club on Chautauqua Lake (Route 17 west of Jamestown.)

Four applications for membership were received and referred to the Board of Managers. One member, *W. H. Beck*, was reinstated. *Robert Hofmann*, librarian, gave a very interesting talk on "Protective Finishes and Galvanic Corrosion in the Aircraft Industry."

Milwaukee Branch

Then Annual Meeting of the Milwaukee Branch will be held Saturday April 30, 1955 at the Schroeder Hotel. The meeting will open at 9:30 A. M. and will feature a discussion of water problems in plating and allied industries. *William Neil* of the Columbus Branch, (Sup't Columbus Metal Products Co.) who has served on the Ohio River Valley Committee on pollution problems will be the honorary chairman. He, as first speaker, will discuss how this group is solving the problems connected with water in their area. *Theodore F. Wisniewski*, director of "Committee on Water Pollution" for the state of Wisconsin, will discuss pollution problems in Wisconsin and adjacent areas which are currently under study. *Dr. Tooper* of the National Aluminate Corp. of Chicago will discuss "Ion Exchange Methods for Water Treatment and Waste Disposal."

Dr. Ralph Schaeffer, president of the A. E. S. will discuss the affairs of the society very briefly and will deliver

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The Editorial Board will hold it's meeting in Milwaukee on April 29th as guests of the Milwaukee Branch.

E. H. McCoy,
Publicity Chairman

Indianapolis Branch

Guests present at the March 2nd, 1955 meeting included *L. J. Howald* of Cincinnati Branch and *John Lockerbie* of St. Joe Valley Branch. Thirty-two members and guests met at the Fox Steak House. Order of business included reports by secretary and treasurer, report by *Quentin Shockley* on the annual session of April 23rd and a report from *Robert VanHouten* about the program for the session. This will consist of:—

1. *Dr. George Dubpernell* — Manager of Waterbury Laboratory of United Chromium Inc. Topic — "Hard Chrome".

2. *Dr. Gregoire Gutzeit* — Associate director of Research and Development — General American Transportation Corp. Topic — "Electroless Nickel."

3. *Frank Scheufele* — Field sales engineer of Beckman Division—Beckman Instruments, Inc. Topic — "pH and Plating."

Concerning the meeting of the Tri-State Regional, *Herb Kennedy* reported that this is to be made permanent and a set of rules was read. *Abraham Max* made a motion that the Indianapolis Branch participate as a full-fledge member. This was seconded by *Les Reynolds* and was carried. *Jack Vaughan* moved that the president, *Elmer Lundberg*, appoint two representatives for the full period designated to represent us on Tri-State Regional group. This was seconded by *Harry Smith* and was carried. The secretary was instructed to send a letter of thanks to the public relations department at Allison's in care of *John O'Brien* for the splendid hospitality extended to members at the February meeting.

Mr. Lockerbie gave a short talk about the qualifications of *Duke Wysong* who is a member of the St. Joe Valley Branch and running for third vice-president in the coming June election at Cleveland.

The branch has received the TV script from the Newark office and the president appointed *Harold Tossell* and *Frederick Anderson* to study it and report at the next meeting. It was announced at this meeting that there would be no branch exhibits at the Cleveland convention.

The program was given by *Kenneth Stillabower*, safety representative from Eli Lilly Co. His topic was titled "Accidents I Have Known." Mr. Stillabower cited many accidents, how they happen and how costly they are. Two factors exist to cause an accident and they are first, an unsafe condition and second, an unsafe act. The safe operation is an efficient operation and it is always good business not to have accidents. He had several instruments which are used to check various conditions in a plant. One was to check carbon monoxide and another to check any flammable vapors. Since we are all familiar with cyanide and its fatal characteristics, he stated that each plant should always have on hand and on the job amyl nitrate inhalation capsules to treat anyone who might be overcome by cyanide fumes. Mr. Stillabower especially stressed that small businesses should take advantage of the

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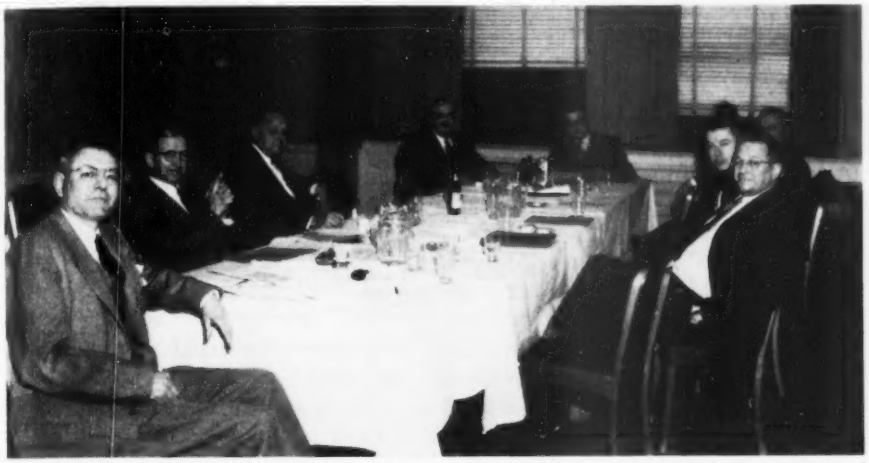
It is only logical that this should be the case. Nothing in MFSA operates to coerce or restrict any member. None has signed any commitment; each is free to conduct his business ethically as he thinks best, and the Association exists to furnish all the degree of cooperation in promoting the general interest that its growing resources permits. All this, of course, in addition to its traditional hospitality to the Annual Conventions of the AES. This means that MFSA is a trade association within the meaning definitely approved by the Federal Trade Commission, exerting no compulsion and excluding no member of the industry.



Shown above are some of the directors and committee members who attended the meeting of the MFSA held January 29 in Chicago. Seated, left to right: Gus Munning, George A. Stutz, Charlie Berry, Bill Belke, Manson Glover, Hank Kellner, Herman Struckhoff, Ray Ledford and Hank Nice.

Support of A.E.S. Activities

It is the present policy of MFSA to discourage response to appeals for donations from Branches or Regions of the American Electroplaters' Society, but that we do not object to the financing of meetings and the like by the purchase of advertising space in programs.

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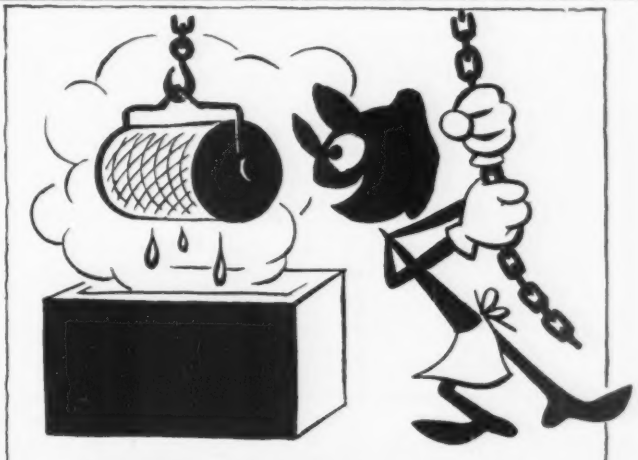

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hand, has at least the form of a legitimate business proposal. It may be declined without offense, and if accepted it gives recognition in proportion to support.

There is also the question of contributions with a printed list of donors. Some branches set up lists of "Patrons" or "Boosters" to include respondents to these appeals. This is certainly legitimate when the patrons are all in the immediate home territory and members of the branch; but when requests are sent to suppliers miles beyond the boundaries the practice seems equally to pass the bounds of ethics.

Special Badges at Conventions

Your Trustees are also seeking ways of impressing on the AES the extent of the support that MFSA is giving Conventions. The traditional Open House can cost up around six thousand dollars in a city like New York or Chicago, and with exceptions such as our hosts at Buffalo evidenced in 1951 there has been little disposition for Convention committees to call this fact to the attention of the beneficiaries. Your Trustees are wholly realistic in wanting such recognition, and we hope for a better publicity in Cleveland. One idea in this connection is that MFSA request a special form of badge for its members, either a different color and imprint to be issued at registration or an additional ribbon or emblem to be furnished by MFSA to its members. One by-product advantage would be identifying a supplier to exhibitors at expositions, which would act to eliminate wasting time on competitors without hope of reward. This matter is in the hands of the Program Committee: if you can contribute a workable idea send it to Dave Clarin at Oakite Products, Inc., 19 Rector Street, New York 6.

Future Conventions and Shows

We plan that Convention arrangements will be handled in the future by MFSA contact members working with Convention committees. The AES is hospitable to the idea, and our Vice-President Merton Beckwith is sitting in for us with the Cleveland committee. Vice-President, Joe Duffy is similarly working with the Baltimore-Washington group. Contacts with Montreal and Cincinnati will be set up in due time and the important connection with the Detroit exposition of 1959 will be established between now and the Cleveland meeting.

We have received a strong suggestion that after Cleveland the expositions open on Tuesday instead of Monday. Purpose: to eliminate double pay on Sundays by labor employed in setting up exhibits. This idea is offered for reflection and discussion: there is no call for immediate action.

Metal Controls

MFSA is now represented by Hank Nice in the matter of controls of strategic metals, particularly nickel. Hank is an old Washington Hand and knows the ropes.

Credit Information

The Association is again investigating the credit association matter at the suggestion of Bill Belke.

The treasury is in healthy condition: Treasurer, *Tommy Trumbour* reports 1954 receipts about $600 over outlay and a healthy portion of our reserve

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NATIONAL ASSOCIATION OF CORROSION ENGINEERS

Rules and regulations of the newly formed Central New York Section were approved by the board of trustees of NACE Northeast Regional Division on January 28, 1955. Officers of the section for 1955-56 are *Andrew Kellogg*, Niagara Mohawk Power Corp., Syracuse, chairman; *F. C. Jelen*, Solvay Process Division, Allied Chemical and Dye Corp., Syracuse, vice-chairman and *John F. Richter*, Delrac Corp., Watertown, N. Y. secretary-treasurer.

THE ELECTROCHEMICAL SOCIETY

The Society will hold its 107th meeting at the Sheraton-Gibson Hotel, Cincinnati, Ohio, from May 1 to 5, 1955.

Sessions are scheduled on: Electric Insulation; Electronics, including Luminescence, Oxide Cathodes, Phosphor Application, and Semiconductors; Electrothermics and Metallurgy; Industrial Electrolytics; and Theoretical Electrochemistry. The program includes 184 papers for the four days of technical sessions.

Future Meetings of the Society:

October 9-13, 1955, William Penn Hotel, Pittsburgh, Pa. Sessions to be announced at a later date.

April 29 and 30, and May 1-3, 1956, Mark-Hopkins Hotel, San Francisco, Calif. Sessions to be announced at a later date.

October 28-31, and November 1, 1956, Statler Hotel, Cleveland, Ohio. Sessions to be announced at a later date.

May 12-16, 1957, Statler Hotel, Washington, D. C. Sessions to be announced at a later date.

October 6-10, 1957, Buffalo, N. Y. Hotel and sessions to be announced at a later date.

AMERICAN SOCIETY FOR TESTING MATERIALS

Committee B-8 on Electrodeposited Metallic Coatings met February 3 and 4 in Cincinnati during ASTM Committee Week. One of the most important developments under consideration in the committee is the crystallization of final plans for the Symposium on Properties and Performance of Electrodeposited Coatings to be held during the 1956 Spring Meeting in Buffalo. The Symposium will comprise eight papers including papers on exposure tests and results, thickness, luster, salt spray tests, metal cleaning, conversion coatings, and the comparison of zinc and cadmium plated deposits. This Symposium will be repeated at the ASTM National Meeting to be held in Los Angeles in September 1956.

A special task group reported that the results of a survey do not indicate sufficient interest at the present time for the preparation of specifications for plating metals. A new task group has been appointed to write specifications on nickel deposits produced by chemical reduction methods, better known as "electroless" nickel.

Subcommittee II on Performance Tests is planning a "Fourth Program" on the corrosion resistance of various

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combinations of copper - nickel - chromium deposits on steel. Included in the study will be panels with and without strike platings of nickel and copper—both buffed and unbuffed. Varying thicknesses of chromium will also be considered.

Work is in progress on thickness measurements of electrodeposits by the anodic solution method; also ductility measurements. Various stages of progress were reported by task groups considering Recommended Practices for the Preparation of and Plating on Lead and Lead Alloys, and on Malleable and Cast Iron, and a third group developing a recommended practice for cleaning of metals prior to electroplating.

A note is to be added to the Recommended Practice for Chromium Plating on Steel for Engineering Use (B 177) cautioning against the baking of chromium-plated steel parts to relieve hydrogen embrittlement. The cautionary note will point out that excessive baking results in the reduction of fatigue strength.

An exposure test of cadmium-treated electrodeposited specimens will be initiated in the near future with exposures at Kure Beach, New York City, and The Rock Island Arsenal.

Officers of Committee B-8 are: Chairman, *C. H. Sample*, The International Nickel Co., New York, N. Y.; Secretary, *R. B. Saltonstall*, The Udylite Corp., Detroit, Mich.

CHICAGO ELECTROPLATERS INSTITUTE

Robert L. Giesel

The *Chicago Electroplaters' Institute* has elected *Robert L. Giesel*, president, Adolph Plating, Inc., as chairman to succeed *Charles N. Jensen*, Jensen Plating Works. Also elected were *John Lietz*, B. Mercil & Sons Plating Co., who succeeds Giesel as vice-chairman, and *Harold W. Baker*, Electro Galvanizing Co., succeeding Lietz as secretary-treasurer.

Elected to the board of directors were retiring Chairman Jensen; *Erwin Elies*, Berteau-Lowell Plating; *William Blacklidge*, Craftsman Plating & Tinning Corp.; *Philip Ritzenthaler*, Plating Engineering Co.; and *John Samaras*, C. S. Samaras & Son.

The Chicago Electroplaters' Institute is an association of 100 job-shop plating plants in the Chicago area.

NEW BOOKS

Pocket Book of Chemical Technology

By V. Stannett and L. Mitlin. Published by Chemical Publishing Co., Inc., 212 Fifth Ave., New York 10, N. Y. 1954. Price: $4.75. 283 pages including index.

This handy volume contains the essential information generally used by chemical technologists in much more convenient form than the usual complete handbook. The data include both chemical and engineering materials and properties, mostly in tabular form, and an extensive glossary of terms. It might appear that this little book is somewhat high priced when compared with the price of the same publisher's *Handbook of Chemistry and Physics*, which is about ten times the size. However, for those who prefer the more convenient dimensions, the pocket book will be found quite handy.

Dictionary of Metallography

By R. T. Rolfe. Published by Chemical Publishing Co., Inc., 212 Fifth Ave., New York 10, N. Y. 1955. Price: $5.75. 287 pages.

Although the title would indicate that this dictionary is restricted to metallographic terms, the book includes pertinent terms from collateral sciences, such as chemistry, physics, and physical chemistry. The definitions are well cross-referenced and provide more than just a compilation of terms, including as they do explanations and references where deemed important. The technical man who has been too busy to keep up with the new terminology will be able to refer to this volume for clarification on terms with which he might be unfamiliar. Since over 1300 entries make up this compilation, he will have a good chance of finding what he needs.

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640	39	West.
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940	32	Elec. Prod.
1500	13	Columbia
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1500	40/65	G. E.
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CHROME OINTMENT for chromium sore healing.
NICKEL-ITCH OINTMENT for platers' itch.
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Stevens automatic 140 ft. long with 58 inch life. Will trade for surplus plating equipment or sacrifice for cash sale.

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Muskegon, Michigan

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SITUATIONS WANTED

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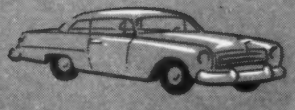

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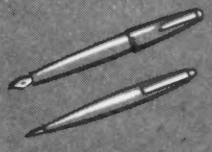

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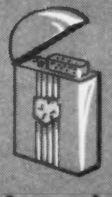

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